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## Urgent Reform of Coal Industry operating standards required

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“I am appalled at the very dated health standards causing much unnecessary death and disease in the Hunter” stated UK Industrial air pollution expert, Dr Dick van Steenis, when he toured the Hunter region last week. He noted some parts had death rates as much as 37% above the national average and was positive the poorly regulated coal mining and power generation industries are to blame. Compounding the problems from coal is the temptation to use power stations and bulldozers as defacto hazardous waste disposal units reducing the cost to coal companies but causing enormous escalation of health damage.

Dr van Steenis visited coal communities and lectured in Gloucester, Liverpool Plains, Singleton, Muswellbrook, Newcastle and ending at the Environmental Defenders Office in Sydney. The following is a synthesis of his observations and recommendations.

### **Dust problems, PM10 and PM2.5 – SIZE IS IMPORTANT**

Open cut mining produces dust particles at several stages in production. Both the size of the particle and the content are critical to causing health damage.

For dust to enter lung tissue it must be less than 3microns in diameter. Larger coarse particles breathed in will get caught in the hairs and mucous of the nose and bronchi. The convention is to describe coarse dust particles between the size of 10microns and 4 microns as PM10. Fine dust particles are conventionally measured as PM2.5. (A human hair is about 100microns in diameter). Whilst even much smaller ultra fine particles are produced in large numbers they are probably too small to cause major health effects. It is PM2.5 and PM1 particles that are the critical ones for human health. PM10 particles cause nuisance effects of dirtying all surfaces and if they get into the water supply such as rainwater tanks their toxins will be dissolved and can then produce health effects. The processes that produce PM2.5 tend to be different to the processes that produce PM10 and their levels bear no relation to one another. This fact is critical to understanding the deadly uselessness of the Australian dust monitoring system which is all built around measuring PM10 levels – there is no standard for PM2.5, and it is not measured or reported.

### **World-wide PM2.5 legislation**

USA commenced legislation for PM2.5 levels in 1997 and they have noted a 6% reduction in mortality rates and a reduction in the associated health bill. Canada, Japan and France have followed suit. In contrast, in other polluting countries such as Australia the mortality rates and health expenses are rising.

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## **OPEN CUT MINING DUST PRODUCTION**

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The mechanical processes of mining produces some PM2.5 but the majority of the dust is at least PM10. PM2.5 is produced in greatest numbers by processes that involve burning. At an open cut mine it is primarily the bulldozers and blasting which are the culprits plus any burning that may occur of a coal seam. Each large bulldozer

can emit the same number of fine particles as 900,000 Volvo P70 petrol cars. Even a small open cut mine is likely to have at least five of these heavy mining vehicles operating and large mines many more. Typically a bulldozer does not have a particle trap on the exhaust and the hot exhaust fumes are thrown into the air, rise and travel several kilometers. The cooling of the night air causes the particles to fall leading to coughing and asthma in children and young animals at night. (Most of a cars exhaust fumes have fallen to the ground within 100metres). If the diesel fuel is a low grade or mixed with oil refinery waste it causes the particles to reduce to PM1 size and will contain many more toxins.

Blasting usually only occurs about once per week but the gases produced are very toxic. Blast gases are not normally monitored despite their toxicity.

The processing, stockpiling, loading and transport of coal from over 30 mines to Newcastle and the loading onto ships are processes that cause coal to rub against hard surfaces and produce more dust. Water suppresses only coarse particles and dries out on long journeys so that the quantity of emissions from the uncovered coal rail wagons does not reduce even after several hundred kilometers. Every community beside the rail line is at risk as are the Newcastle suburbs within 3 kilometers of the coal loaders. (Wheat carried by rail and coal carried by road is covered. Why not oblige coal rail wagons to be covered?)

### **Water contamination from Open Cut Mining**

Coal is washed in the processing plant and this requires about 200litres for every ton of coal. The dirty slurry is usually diverted to a dam which would need to be lined by 17feet of clay to absorb all the toxins and not leak them into the ground water. We know of nowhere that this has been done. Dirty water from Gunnedah area mines drains into the Murray-Darling system contaminating an enormous food bowl area. We are told areas of land at Ravensworth are still unsafe for stock 30 years after 'rehabilitation'.

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## **POWER STATION DUST PRODUCTION**

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When pure coal is burned most of the particles are PM5 and do not enter the lungs, however about 20% of the particles are smaller and can enter the lungs. If impurities are added the particles are reduced to PM2.5 and PM1. Several people informed us hazardous waste including medical hazardous waste is being added to the coal at Liddell Power Station making it function as an incinerator even though the operating temperature is far too low for the waste to be properly broken down to safe basic particles. Mercury is just one toxin released by such plants. Dr van Steenis stated this is the most dangerous operation he encountered in his tour and in his opinion should be closed down. (If a power station is to operate as an incinerator as well it needs to be by the plasma gasification process which Dr van Steenis suggested should be built at Liddell since this process needs electric power and hazardous waste will continue to be widely produced and needs to be eliminated.)

Much of the coal in the Hunter Region is high in sulphur content and this will make particles acid and increase their toxicity. More than 200 different substances can be emitted so Power Stations need extensive emission control devices. Older power stations such as those in our valley are usually missing much of the controls which

could make them safe. Flue Gas Desulphurisation (FDG) is usually absent in older power stations as is means of elimination of very toxic nitrogen oxide gases. The bag filters which these older power stations have do not capture the smaller most deadly PM1 particles which are typically present when toxic waste is being added.

The haze, which greeted us as we travelled south from the Liverpool Plains into the Hunter, is comprised of PM2.5 and the density of haze has been demonstrated to be directly proportional to asthma increased mortality rates in the USA.

The high smoke stacks cause the dust particles to fall more further than with bulldozers. Every 100feet of the smoke stack distances the point that the fallout occurs a further 10km, with maximum levels again at night as the air cools. Thus both Singleton and Muswellbrook townships are in the drop zone of Liddell, Bayswater and Redbank Power stations. Prevailing winds tend to be up and down the valley and just a few hours of PM2.5 fallout can trigger heart attacks and asthma. Hunter Valley horse studs around Scone fear the dust is affecting their foals.

Damage from Power plants is detailed in a report "Death, Disease and Dirty Power" available on the web.

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## HEALTH DAMAGE FROM PM2.5 COAL PARTICLES

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When a fine dust particle lodges in the lung the body's immune system mounts a defence. Macrophages transport bits of coal to the lymph nodes but most of the particle is walled off with fibrous tissue whilst the T lymphocytes neutralize some of the toxins. The body has a limited supply of these immune cells so that numbers drop throughout the rest of the body leading to increased susceptibility to infections and vaccines.

### **Respiratory system effects**

Just a few hours exposure to acidic particles will trigger a further attack of asthma in the predisposed. Children living 1.5km from a mine have a 33% risk of asthma, at 3km the risk is 22% and at 5km it is 12%. Particularly nasty toxins called Polycyclic Aromatic Hydrocarbons (PAH) and dioxins can damage the genes causing mutations which will produce new proteins that in turn lead to new cases of asthma. The fibrosis leads to Chronic Obstructive Pulmonary Disease (**COPD** – Australia's fourth biggest killer) with evidence of permanent damage in children as young as 12 years old in areas with high PM2.5 rates. Lung cancer increases in these same areas due to gene damage.

In Singleton Dr Tuan Au has commenced testing the lung function of children and has already tested nearly 700 children with the aim of following them for five years.

### **Cardiovascular system effects**

The platelets and other blood components become more viscous leading to clots in arteries whose walls have been roughened. Lipids are changed resulting in more fatty deposits in the vessel wall. Heavy metals in the coal such as nickel affect the electrical conductivity of the heart and cadmium attacks the elastic lining of vessels leading to aneurysm formation. The net effect is an increase in deaths from heart

attacks and strokes. Blood vessels in the placenta are damaged leading to low birth weight babies.

### **Neurological system effects**

Mercury breaks down the blood-brain and blood-bowel barriers letting in other toxins such as PAH which lead to a reduction in intelligence and an increase in autism and other damage which releases challenging (antisocial) behaviours.

Lead from coal and released from the roofs by acid rain running into rural rainwater tanks leads to brain damage. Arsenic is also found in coal.

The chemical toxins cause lethargy and depression with clusters of increased suicide noted downwind of one incinerator. Rare neurological syndromes occur in clusters such as a group of people with Motor Neurone disease presenting in one street in Muswellbrook. Immune disease such as Multiple Sclerosis increase.

### **Metabolic and other effects**

Thyroid function is often suppressed and combined with the lethargy arising from chemical toxins this can result in over-eating and excessive weight gain. Diabetes 2 rates increase. Eye diseases and skin rashes and infections all increase.

All the above damage to physical health is compounded by the psychological stress and depression arising from enforced changes to life plans, loss of quality of life, grief at the changed landscape, perceived powerlessness etc. Noise impairs concentration and sleep. Low frequency machinery noise (28Hz) may resonate in body cavities and people's rooms and interfere with nerve conduction.

More detailed descriptions of all the above are found in Dr Dick van Steenis's papers such as "Coal opencasting and health" and in the recent report from Physicians for Social Responsibility titled "Coal's assault on human health". This latter document notes that in 51 metropolitan areas in USA where legislation forced the reduction of PM2.5 levels there were significant increases in life expectancy. A detailed reference list of 370 scientific papers supporting the above is available on request.

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## **FINANCIAL IMPLICATIONS**

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Professor Mike Hendryx has shown the costs from health damage from coal in USA is five times the value of the coal. In Australia a recent CSIRO report by Tom Biegler et al titled "The Hidden Cost of Electricity" similarly highlights the enormous burden coal imposes on this country's economy. The NSW Government is currently having difficulty paying its health bills, one of the contributory factors is likely to be a consequence of ignoring for years the hard evidence that exists about PM2.5 levels and health damage. Dr van Steenis frequently made the point that long term unpolluted water availability, sustainable food production and good health should be our Government's priority. What analysis is done to assess the future cost of health care that will be required to address the consequences of allowing PM2.5 dust to fall on residential subdivisions during the planning assessment process? Where does the health of the people of NSW rank vs economic considerations during the planning assessment process for open cut coal mines?

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## **LEGAL ASPECTS**

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Tim Robertson, a barrister specializing in environmental law, noted at the EDO that with the escalation in open cut coal mining in the Upper Hunter, dust levels are now apparently frequently exceeding existing mandated levels (PM10 levels which are decades out of date); that this is a serious problem, and that something needs to be done. He indicated that Air Pollution is more difficult to assign responsibility for than water or land pollution because it is more difficult to prove the source of the pollution. (Note that biopsies of lung tissue for dust samples for analysis may assist in overcoming this difficulty as coal has area specific levels of constituents ie sulphur.) He stated that the laws relating to Air Pollution in NSW can be difficult to understand; one aspect is that it is only a crime if the process producing it has been demonstrated to be inefficient.

A law professor who also spoke at the EDO indicated that any potential class action would be greatly assisted by data of lung function in a group of children (or horses for that matter) prior to damage from coal dust (the establishment of baseline data). Any person believing they have been damaged by coal dust should investigate the possibility of registering their case with The Dust Diseases Tribunal in order to be suitably compensated. There may be potentially 50,000+ such people. One successful case may lead to a flood; note that in the UK claims for damage from breathing coal dust (COPD) were expected to be 600 million pounds. The total ended up at 4.1 billion pounds.

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## **WHAT CAN BE DONE TO REDUCE THE DAMAGE**

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- 1) Call a moratorium on any new development until a plan involving the following points is enacted
- 2) Conduct a Health Study in already affected areas investigating mortality rates, low birth weight incidence, genetic malformations, post mortem lung damage. Document asthma, heart attack, stroke and cancer rates in coal communities.
- 3) Require a Health Study as part of any application to mine. By not assessing the health risks associated with mining activities, there is potential legal exposure that could prove costly to the taxpayer – aside from being hazardous to their health.
- 4) Extend baseline lung function measurement in children beyond the study commenced in Singleton.
- 5) Legislate buffer zones, particularly downwind of any new development. Note asthma incidence in studies in the UK reveal that at 4.8km from open cut coal mines the rate is 13%.
- 6) Legislate for PM2.5 levels to be the monitoring standard in future. There seems little point in monitoring dust particles that are less dangerous, while ignoring the dust particles that are more dangerous. The technology to do so is freely available. Where the mandatory levels are breached, appropriate

action needs to be taken immediately. In the USA, plants can be shut within an hour for this reason; in Australia it is self assessment, with no local compliance officers in the Upper Hunter.

- 7) Purchase PM2.5 Beta Attenuated Monitors that are accurate to 1% and that are factory calibrated and sealed. If this is not done by the State, it should be done at a community level. Place monitors in all affected school yards as well as upwind and downwind of sources. Continuous monitoring needs to be done with results posted on the web. This needs to be done to get an accurate picture of the levels of PM2.5 dust that are currently being generated, and this dust can be sent for analysis. In this way the facts become apparent as to the level of dust being generated as well as its source. This monitoring needs to be done independently from the source of contamination.
- 8) Ensure heavy mining vehicles use high grade diesel fuel with no additions and their exhaust have particle traps fitted
- 9) Monitor Blast gases. CSIRO research reveals toxic gases with known adverse health effects from this source only become equivalent to background levels at 5km from the blast site.
- 10) Cover Coal Rail Wagons
- 11) For existing at risk families, purchase HEPA air filters for all houses at risk. These cost \$500 each retail for the best filters which should be placed in schools and close to the bedroom of any affected child.
- 12) Check all affected rain water tanks for contamination. Advise accordingly.
- 13) Recommend that affected adult individuals (subject to approval from their healthcare practitioner) take Selenium 200 microgram for one month and then 100microgram daily (dosage to be confirmed by healthcare practitioner). This boosts T lymphocyte production and lowers heavy metal contaminants. Subject to individual medical advice take 1gram daily of Vitamin C which reduces mutations. Consider also taking Vitamin E.

In addition, where power stations are present:

- 14) Tighten hazardous waste surveillance.
- 15) Close power stations such as Liddell which are burning hazardous waste and replace them with a plasma gasification plant.
- 16) Ensure all power stations have the maximum emission protection devices

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On behalf of the consortium of community groups organizing Dr van Steenis visit to the Hunter.