

SYDNEY BASIN: AIR TOXIC EMISSIONS & HEALTH UPDATE

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This paper observes and compares patterns of above average rates of lung cancer occurrences in the Sydney metropolitan area with typical patterns of air pollution circulation within the Sydney basin, as well as with the locations of primary source and 'sink' areas of toxic air emissions. It establishes that there is a strong coincidence, which is unlikely be entirely due to the demographics of cigarette smokers. The paper also compares the Sydney patterns with patterns of cancer risk observed in overseas studies, and finds similar coincidences. Such coincidences raise broad, international-scale, health concerns and are worthy of further detailed study.

1. The Sydney Metropolitan Area

Primary air pollution sources - such as Sydney Airport, Port Botany and the Kurnell refinery - are located in the narrow, eastern part of the Sydney Basin, adjacent to the Central Sydney Industrial Area and an oil refinery (Figure 1b). In densely populated suburbs near to and downwind of these facilities, and also in the 'smog sink' area of the western part of the Sydney Basin, there is sufficient evidence of above-average occurrences of lung cancer and respiratory illnesses to warrant public concern.

The Sydney basin is a classic "closed" basin, bounded by mountains and hills to the south, west and north, and by temperature differentials between land and ocean on the eastern side. Trapped pollution may accumulate and circulate inside the basin periods of several days [1, 2] until a strong wind, such as a "southerly buster" or strong westerlies, flushes 'dirty' air out of the basin. Temperature inversions exacerbate the smog trap situation with relative frequency.

Sydney's highest lung cancer occurrences are found in two areas of the Sydney basin that are strongly coincident with primary pollution sources in the eastern part of the basin and in the western Sydney basin air pollution sink area.

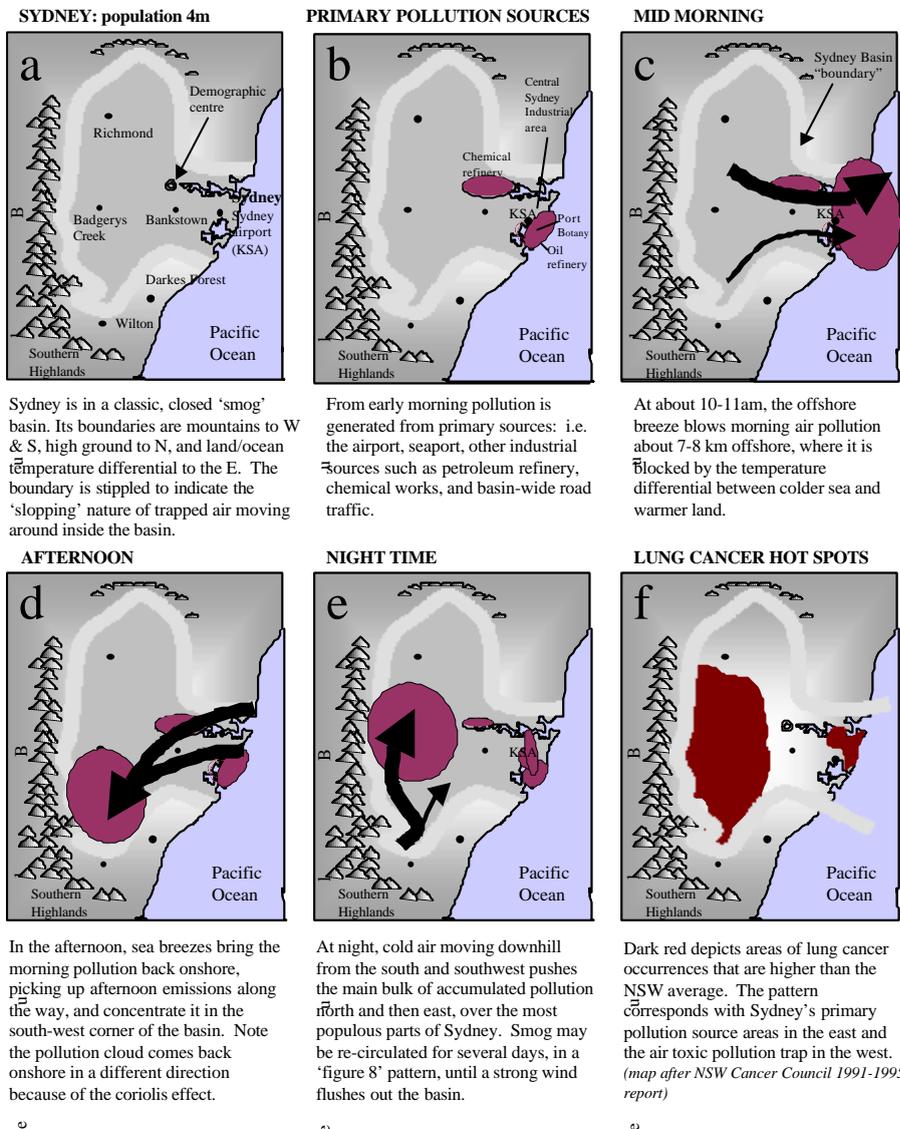
Higher than NSW State average lung cancer patterns shown in dark red on the figure above are sourced from NSW Cancer Council maps [3]. The cancer occurrence patterns cannot be simplistically explained away by tobacco usage alone. It may however be reasonable to assume that smokers living in areas of high air pollution may be more at risk of developing lung disease than smokers living in cleaner air environments. And the same should also be true of non-smokers. These observations indicate that there is reason to be concerned about the health impacts of air toxic transport emissions, but as yet no such health risk studies have been conducted for the Sydney metropolitan area (i.e. the Sydney basin) by government.

The patterns indicate that Sydney is experiencing a significant number of lung cancer occurrences – not to mention other air-pollution related illnesses - which represent calculable costs. The average direct cost for treating a cancer case over time is A\$100,000 and rising [4].

Figure 1 shows the typical daily cycle of air pollution in the Sydney basin, for days when air is trapped inside the basin.

Figure 1 [Map drawn after Ref 1]

Sydney Basin: trapped air pollution circulation & lung cancer occurrence



2. Overseas

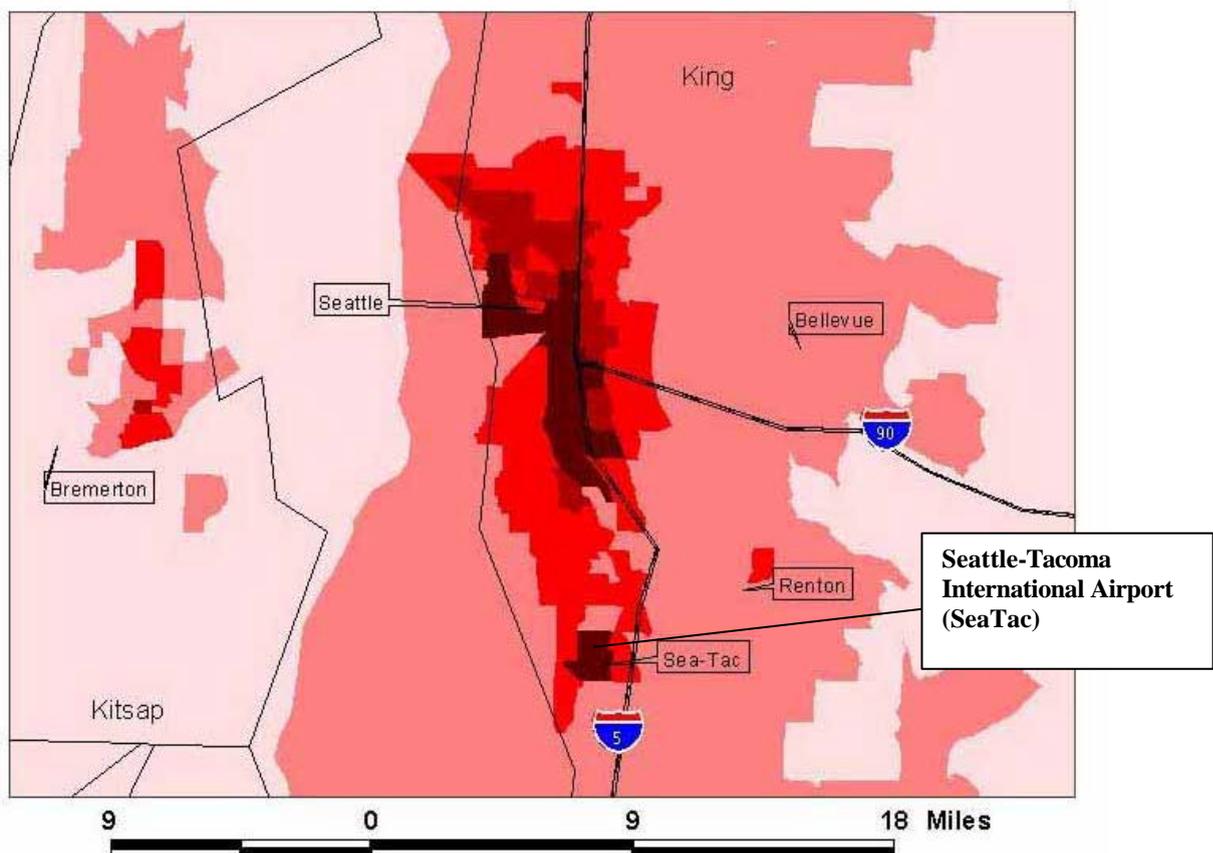
There is a predictable similarity between the areas of above-average lung cancer occurrences observed across the Sydney Basin (Figure 1) and the patterns of high cancer risk associated with major airports at Seattle (Figure 2) [Ref 6], Minneapolis St Paul [Figure 3, Ref 5], and Chicago [7]. These findings support the results of other overseas studies [8, 9].

The US EPA Cumulative Exposure Project study of the Seattle metropolitan area [6] shows that the lifetime cancer risk per 100,000 persons exposed to toxic emissions in and around SeaTac airport range from 200 to 400 times EPA's recommended "safe" level of carcinogens in the air. Such a high negative health risk surrounding Seattle's SeaTac international airport is

particularly interesting because of the relative lack of other forms of industry around the primary airport.

Sharon Skolnick of the Earth Island Institute reported that the State of Washington's Health Department Census, which compared 1991-1995 health data for people living near Sea-Tac Airport with those of Seattle residents overall, found that "infant mortality near the airport was 50 percent greater, heart disease was 57 percent greater, cancer deaths were 36 percent greater." For people living near the airport, overall life expectancy was found to be 5.6 years shorter. That is not to say that it has been established that airport-generated pollution was the cause (or more likely one of several causes), but it suggests that far more attention to such a possibility is now warranted.

Figure 2 US EPA Cumulative Exposure Project Map -- Seattle cancer risk

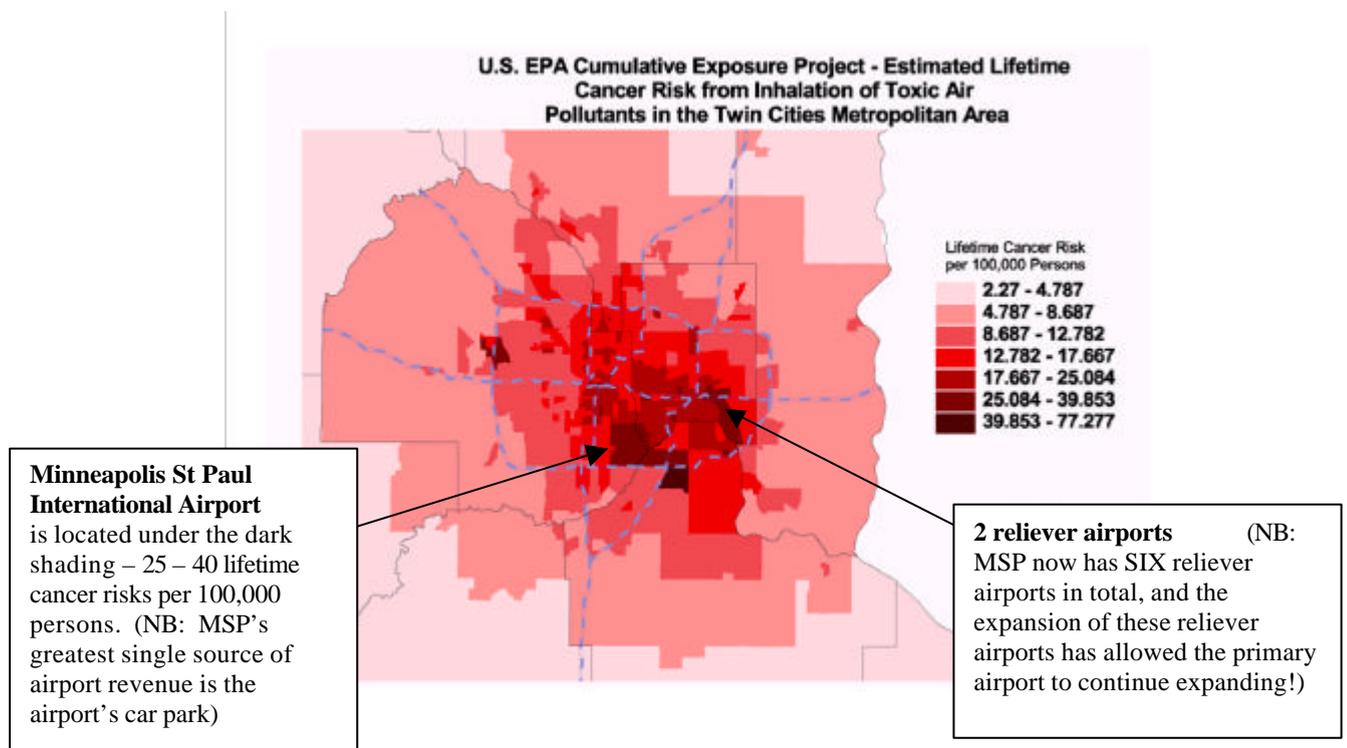


The US EPA CEP study found [Ref 5] that more than half (53 percent) of the estimated excess cancer risk from all air toxics in the Minneapolis St Paul metropolitan area comes from mobile sources such as cars, trucks, airplanes and off road vehicles.

In comparing Minneapolis St Paul lung cancer risk patterns with actual occurrences in the Sydney Metropolitan area, the following differences should be noted:

- benzene in Australian petrol (leaded and unleaded) is around 2-3 times higher than is permitted in the US and the European Union. Likewise, reactive hydrocarbons that are precursors to 1,3 butadiene are believed to also be higher in Australian fuels.
- toxic air emissions typically accumulate in the classic, “closed”, Sydney basin – frequently for periods of several days - until a strong regional wind ‘flushes’ polluted air out of the basin; Minneapolis St Paul is located in a relatively more open terrain.

Figure 3. US EPA Cumulative Exposure Project Map – Minneapolis St Paul cancer risk



Given the higher levels of benzene, etc., in Australian motor vehicle fuels, it is suggested that health warning labels - similar to those appearing on Californian petrol bowsers (where benzene in fuel may not exceed 1%) - should be affixed to Australian petrol bowsers to inform citizens about the carcinogenic content of Australian fuels and potential health risk.

It has been observed in Britain that children born near certain industries, such a petroleum refineries, furnaces, etc., and near major roads, ports and airports are around 20% more likely to die in childhood from cancer than children born in cleaner air environments [9].

3. Other Studies Showing Links between Ill Health and Air pollution

Negative health implications for children of exposure to air toxics have been summarised by NRDC [10]. Children are more vulnerable to air toxic emissions than adults because of their relatively small body size.

Negative health implications from diesel fumes are well known, and were summarised recently by Dr Peter Fisher, of Gladstone University, Qld. [11].

A study on the effects of air pollution conducted by researchers from the University of Southern California Keck School of Medicine and the National Institute of Environmental Health Sciences [18], has found that changes in air pollution exposure during adolescence has a "measurable and potentially important effect on lung function growth and performance." Their findings showed that "ambient air pollution exposure has a similar magnitude of effect on lung function development to that previously observed for children who are active smokers," the researchers said. The research appears in the current issue of the "American Journal of Respiratory and Critical Care Medicine," published by the American Thoracic Society. The study is available from the Clean Air Trust at <http://ens-news.com/ens/dec2001/2001L-12-14-09.html>

Devra Lee Davis, a professor at Carnegie Mellon University's Heinz School for Public Policy and Management in Pittsburgh, said recently that ozone, particulates, carbon dioxide and other pollutants from the combustion of fossil fuels already are public health hazards. She said that there are more than a thousand studies from 20 countries all showing that you can predict a certain death rate based on the amount of pollution." [19]

Reporting on the Carnegie Mellon study (Science, August 2001), an ABC News Radio report, 21 August 2001 titled "Pollution Kills", states "*the Carnegie Mellon study showed that more people are being killed by exhaust fumes than by traffic accidents - and Australia has the highest level of exhaust emissions per capita than anywhere else in the world. The findings come from an international study focusing on the health effects of pollution from fossil fuels on people living in four of the world's largest cities. The results are staggering. Some 64,000 people living in these cities are likely to die from the effects of air pollution in the next 20 years, if nothing is done now to reverse the trend. When applied to the rest of the world's urban centres, the projected death toll rises to a massive eight million.*"

In the late 1990's, premature mortalities from particulates were observed to be in the order of 400 per annum [12]. Asthma is also common in Sydney, and risk of heart attacks also increases on days of high particulate pollution.

Particulates are known to represent a health problem in the Sydney metropolitan area. Exceedences of PM10 fractions have been occurring in inner city suburbs for several years. PM2.5 particles may present an even worse problem for health. Of particular relevance and concern is that PM2.5 particles which pass through a polluted urban air column may carry or "piggyback" carcinogens deep into human lung tissue, beyond the lung's natural ability to expel them, thus becoming potential sites for future tumours.

In Sydney, a 1998 study of daily hospital admissions and outdoor air pollutants [17] showed that an increase in daily maximum particle concentrations was associated with an increase in hospital admissions for chronic obstructive pulmonary disease and heart disease admissions for older people.

3. Government Response to Air Quality Concerns

Despite being officially apprised (Questions Without Notice, John Murphy, MP, Lowe, NSW) of relevant recent overseas research, the Federal Minister for Transport has denied any potential or significant link between air toxics generated by Sydney airport and cancer occurrences or risks, and has failed to acknowledge that such risk may be present. NSW Government has also acted to mislead citizens and suppress citizens concerns about toxic transport emissions. It's ignorance of, or contempt for, citizens' health is also demonstrated by its refusal to filter the exhaust stacks of new private toll road tunnels.

To reduce health risk it is imperative to reduce the amount of air toxic emissions being generated inside the Sydney basin air shed. So far, both major political parties have ignored public concerns and good science and over the past couple of decades have actively encouraged the growth of private motor vehicle numbers on Australian roads, whilst neglecting public transport.

State and Federal government studies of health impacts of urban air pollution have been limited to the effects of carbon monoxide, nitrogen dioxide, ozone, sulphur dioxide, lead and particulates. The health implications from long-term exposure to specific carcinogens and toxics related to total airport, marine port operations and other industrial activities, such as benzene, 1,3 butadiene, formaldehyde, and arsenic, have not been assessed across the Sydney basin.

Air Quality Policies Remain Uninforced: So far, there are very impressive-sounding government policies for reducing urban air toxic emissions. These are centred on reducing the numbers of private motor vehicles and increasing public transport useage. However, in reality, the opposite is being achieved. The air quality policies are simply not being enforced.

Roads DO Induce Traffic: There is compelling evidence that building more roads provides only short term relief to local traffic congestion. It induces traffic, attracts passengers away from rail and into cars, and thus increases air toxic pollution over the long term.

All Sydney roads lead not to Rome, but to Sydney Airport: Despite clean air policies, the funding of serious development of public transport continues to be neglected in favour of constructing major private toll roads (the Sydney Orbital).

These toll roads are primarily focussed on Sydney Airport - and secondarily focussed upon the temporarily moth-balled spillover airport at Badgerys Creek). Health concerns were glossed over at all stages of the pre-development through to commissioning of the various sections of these new toll roads and their associated, unfiltered, tunnel exhaust stacks.

In the last few months, the sale of Sydney Airport has delivered it into the hands of the beneficiary of most if not all segments of the Orbital toll roads. This corporate entity now controls its own revenue stream, i.e. the airport car park and the roads that feed into and out

of the airport and neighbouring industrial area. Legally, it may even have circumvented the risk of government ever reining in air toxic emissions from its private road transport operations to 'tolerable levels'.

It has been made apparent through the financial media that the Sydney Airport car park is one of its greatest commercial assets, if not the single greatest, and the new airport operator has inferred that 40-60 per cent growth is required for it to be a commercial success. Expansion of the numbers of passengers passing through the airport equates to significantly more air toxic pollution.

Yet another major private toll road is now being proposed to connect the traffic-gridlocked Northern Beaches area to an already heavily congested feeder road to the Airport and City (i.e. the Brogden 'Manly road tunnel'; January 2003 pre-election proposal). Clearly, a well-planned rail link would be a more appropriate long term strategy: economically, practically and environmentally. (It is noted that private transport lobbyists and the aviation industry are generous donors to both major political parties.)

World's Best Practice? More than 95% of all access to and from Sydney airport is by road, making it far from world's best practice. World best practice in this regard is represented by airports like Schiphol Amsterdam which is aiming for 40% public transport access. Heathrow Airport is reportedly aiming for 50% public transport access.

Airport-related road traffic emissions are traditionally excluded from total airport emissions calculations. Total airport emissions would be best calculated as if in a "bubble", to include aviation emissions and associated road traffic emissions, and any other emissions generated in the course of an airport's operations. The Natural Resource Defense Council's report "Flying Off Course" reported that major airports tend to rank among the top ten single sources of air pollution in their metropolitan areas, based on aviation emissions alone. "The Guardian" reported on July 25, 2001 as follows: *"Emissions from aircraft are a growing contributor to climate change," admits a recent government consultation paper on the future of British aviation. At the same time, the paper goes on, "The effect of emissions from aircraft...is less than that of road traffic to and from airports."*

In Sydney, the numbers, average size, weight and age of motor vehicles is rising, outstripping gains made by improvements in fuel quality [13]. Similarly, aircraft numbers have risen very rapidly indeed, and older aircraft have been kept in service longer than originally intended, outstripping gains made by reductions in individual aircraft engine noise. [14]

Sydney Airport Corporation Limited (SACL) recently claimed that emissions from Sydney airport have not increased significantly since 1992 (a surprising finding, given there has been a one-third increase in aircraft traffic and an even greater increase in motor vehicle traffic to and from the airport during that period of time). SACL furthermore claimed that the emissions measured at their 2 monitors -- one at Sydney airport and the other at Botany -- do not represent a significant health risk to surrounding residents [15]. However, these conclusions were based on limited data and failed to measure specific carcinogens or consider health implications of long-term exposure to such carcinogens and other toxics, and may also have ignored exceedences of PM10 fractions.

Transport Planning: Why No Cost/Benefit Analyses? There has been no formal cost/benefit analysis of the health costs arising from the expansion of the Sydney basin's airports versus the value of a healthy and productive population (such that may be realised by relocating the primary airport to a more suitable location just outside the smog basin, and connected to back to Sydney metropolitan area and its various business district areas by frequent, well-integrated, and reliable rail services). Replacement airports have been successfully realised in Denver, Hong Kong, Munich, and Oslo and soon in Athens).

One possible reason why ill health from long-term exposure to toxic transport emissions continues to be discounted by transport planners, and actively encouraged, perhaps stems from the 'economic rationalist' practice of excluding health costs from financial analyses of projects on one hand, and on the other hand counting the cost of increasing ill health (e.g. visits to doctor) as contributing positively to economic growth. There is an obvious need for both project evaluations and national economics to be holistic and realistic, and to distinguish "good" from "bad" economic growth.

Australia must radically change the way it plans transport infrastructure so that critical land use conflicts like those already plaguing Sydney may be avoided in the future, instead of being exacerbated as is occurring at present. Future generations will not thank current governments (or Opposition parties) for neglecting to embrace long-term economic, social and environmental sustainability as fundamental components of transport planning and urban planning.

Comprehensive, formal studies are urgently required to clarify what proportion of excess cancer risk is due to toxic air emissions and what proportion to other factors such as smoking and exposure to indoor pollution, so as to determine the cumulative impacts of such exposure and make recommendations for sensible precautionary measures to be taken in future urban planning and transport development

It should be noted finally that, just as the tobacco industry is now having to compensate smokers for lung damage, the aviation industry and other private transport companies, cannot expect to be exempted forever from paying a fair share of the human health cost caused by long-term exposure to air toxic emissions -- and noise -- generated by the operations of urban airports, marine ports and their associated road traffic congestion.

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