



Port Hedland – FACT SHEET

1. Dust and Health

What is PM, PM₁₀ and PM_{2.5}?

PM stands for Particulate Matter more commonly known as dust. PM₁₀ and PM_{2.5} refers to the particle size in aerodynamic diameter measured in micrometres (µm).

Are some types of dust more harmful than others?

Particle size is a key factor that influences how harmful dust is to human health. The smaller the particle size (PM_{2.5} and smaller), the deeper into the lungs the particles travel. The deeper particles travel, the more potential for harm.

The evidence is strongest for harmful health effects to be associated with combustion particles of PM_{2.5} and smaller. Coarse particles between 2.5 – 10 µm in diameter are more often associated with mild to severe respiratory effects (depending on an individual's health status and age). However, the World Health Organisation asserts that there is evidence for respiratory and cardiovascular harm from inhaling coarse particles that includes crustal dusts. Crustal dust is dust originating from the earth's crust; some examples are dust/soil from bare earth, unpaved roads, agricultural tilling, excavation activity and related products like ores from mining activities.

What influences particle size and composition?

Not all dust is the same; the composition of dust and the particles size of dust vary not only by location but also temporally, meaning that the composition of dust varies at different times of the day and night even in the same location.

Dust composition is a secondary but important determinant of potential harm to human health. The composition of dust varies with location. In cities, dust tends to be rich in combustion particles from vehicle emissions and is more hazardous than dust which is low in combustion products.

Port Hedland dust by comparison is rich in iron, relatively large in size (between 2.5 -10 µm) with low levels of urban emissions.

Who is at risk?

Persons susceptible to elevated dust levels include:

- Older people (>65 years old).
- People with pre-existing cardiovascular disease.

- Children and adults with pre-existing respiratory conditions such as asthma, bronchitis, chronic obstructive pulmonary disease (COPD).
- Children.

Babies, small children and elderly people are at greater risk of developing chronic health problems from long term exposure.

People with existing respiratory and heart conditions, and smokers, are also at greater risk of developing chronic conditions.

2. Health Risk Assessment

What is a human Health Risk Assessment?

Human Health Risk Assessment (HRA) is a process intended to estimate the risk to a population following exposure to a substance of concern i.e. dust. The process considers the characteristics of the substance of concern and the population of interest, as well as uncertainties in determining the risk.

A HRA evaluates the potential for substances of concern to adversely impact public health. In the example of dust, it is common for a HRA to consider dust from all sources rather than a single source unless specified.

What a Human Health Risk Assessment does not do

A HRA does not consider or test the health of individuals - it is a population based assessment.

A HRA for public health does not consider worker safety – worker safety is covered by Worksafe and occupational and health and safety legislation which protects workers at work from exposure to high levels of contaminants including dust.

How accurate is a HRA?

A HRA is only as good as the data available to the HRA. In general, HRAs are limited by a lack of complete information, simply because it is not possible to know everything about the substance of concern or the population exposed. To counteract this, risk assessments are performed using safety-margins to accommodate uncertainty, as a result, they are more likely to overestimate rather than underestimate risk.

What steps are involved in a HRA?

The Health Department supports the HRA framework endorsed by the national environmental health standing committee of the Commonwealth Department of Health (enHealth). The key steps in the HRA include -

Hazard assessment: Examines whether a contaminant of concern has the potential to cause harm to people, and if so, under what circumstances. One or many contaminants of concern can be assessed in a single HRA.

Exposure assessment: Examines what is known about the frequency, timing, and levels and types of contact with a contaminant of concern.

Risk characterisation: Examines how well the data support conclusions about the nature and extent of the risk from exposure to a contaminant of concern in a given population.

What is Risk Management?

Risk management is a process which considers how to protect public health from risks identified in a HRA. A HRA informs risk management however, risk management is a separate process that lies outside the scope of a HRA.

Risk management considers many factors; the HRA is just one of those. Others include economic, legal, social, political and technological factors. Public values that reflect societal attitudes are also considered. Some or all of these factors are taken into account in the final decision-making process.

3. Health Risk Assessment for Port Hedland Q&A

The Department of Health commissioned an air quality HRA for Port Hedland in response to recommendations made in the *Port Hedland Air Quality and Noise Management Plan*. The Port Hedland Industries Council funded the HRA.

The full report can be downloaded from the Health Departments website.

<http://ww2.health.wa.gov.au/Reports-and-publications/Port-Hedland-Health-Risk-Assessment>

What does the human Health Risk Assessment show?

- The HRA identifies that PM₁₀ concentration in ambient air decreases with increasing distance from the Port.
- During the period of the assessment, areas of Port Hedland closer to the port experienced dust exceedances (dust levels greater >70 µg/m³) more frequently than areas further away. The greatest number of exceedances in Port Hedland were recorded in the West End.
- Patterns of dust exceedances (dust levels greater than 70 µg/m³) dominate the West End of Port Hedland during the winter and spring. Dust sources during these periods are predominantly from the direction of the port and resources industry. However, bare earth such as the spoil bank, regional dust storms and seasonal scrub fires also contribute to exceedances at particular times of the year and in response to certain meteorological conditions.
- The HRA confirms that there is sufficient evidence that increased levels of dust exposure can have an adverse impact on human health in Port Hedland over the long term. This is consistent with the broader scientific literature on the effects of dust on human health.
- The majority of the public health burden of dust in Port Hedland is associated with PM₁₀ concentrations over 70 µg/m³. These effects may be independent of any PM_{2.5} effects although this is not clear, due to the small population.
- Nevertheless, there is no immediate or acute health risk to the Port Hedland community – however the focus must now be on minimising peoples' exposure to dust.
- The number of affected individuals is very low, but only because the Port Hedland population is small (~5000 people).

- The HRA considered a number of dust exposure scenarios. One scenario of importance explores the health impact of the highest dust levels on the population. It asks the question: what adverse health outcomes are forecast if the whole population (~5000 people) of Port Hedland were exposed to the levels of dust experienced in the West End? The important health outcomes were predicted to be as follows:-
 - Increase in long term mortality (premature death),
 - 1 additional death **per year** in areas that frequently exceed $70 \mu\text{g}/\text{m}^3$
 - Cardiovascular disease
 - 1 additional death **every 3 years** in areas that frequently exceed $70 \mu\text{g}/\text{m}^3$
 - Increase in hospital admissions associated with:
 - Respiratory disease for people over 65 years of age
 - 2 additional admissions **per year** in areas that frequently exceed $70 \mu\text{g}/\text{m}^3$
 - Pneumonia and bronchitis.
 - 1 additional admission **per year** in areas that frequently exceed $70 \mu\text{g}/\text{m}^3$
 - Increase in emergency room attendance for pre-existing respiratory conditions i.e. asthma, between 15 - 65 years of age
 - 3 additional admissions **per year** in areas that frequently exceed $70 \mu\text{g}/\text{m}^3$
- Two other important exposure scenarios asked the questions what adverse health outcomes are forecast if the whole population (~5000 people) of Port Hedland were exposed to levels of dust :
 - not greater than $70 \mu\text{g}/\text{m}^3$, and
 - not greater than $50 \mu\text{g}/\text{m}^3$

The important health outcomes were predicted to be as follows:

- Increase in long term mortality (premature death),
 - 1 additional death **every 3 years** for both scenarios.
- Cardiovascular disease
 - 1 additional death **every 10 years** for both scenarios.
- Increase in hospital admissions associated with:
 - Respiratory disease for people over 65 years of age
 - 1 additional admission **every 2 years** in areas not exceeding $70 \mu\text{g}/\text{m}^3$
 - 1 additional admission **every 3 years** in areas not exceeding $50 \mu\text{g}/\text{m}^3$

- Pneumonia and bronchitis.
 - 1 additional admission **every 4 years** in areas not exceeding $70 \mu\text{g}/\text{m}^3$
 - 1 additional admission **every 5 years** in areas not exceeding $50 \mu\text{g}/\text{m}^3$
- Increase in emergency room attendance for pre-existing respiratory conditions i.e. asthma, between 15 - 65 years of age
 - 1 additional admission **per year** for both scenarios.
- Based on the outcomes of the scenarios described above the HRA concluded that $70 \mu\text{g}/\text{m}^3$ for PM_{10} provided a similar level of protection to the current population of Port Hedland as would the national standard for PM_{10} of $50 \mu\text{g}/\text{m}^3$. This is because the population size and make-up influence the outcome; if the population were more than doubled and with more people that are more vulnerable, the health outcomes would be more prominent and demanding of more immediate regulatory control.
- The HRA recommended the dust levels (PM_{10}) should be managed so that $70 \mu\text{g}/\text{m}^3$ is not exceeded in Port Hedland (except under exceptional circumstances). The Health Department supports this recommendation.

Important points about the HRA

In general, a HRA is strictly an analysis that uses information about the dust in Port Hedland and the population of Port Hedland to estimate a theoretical level of risk for people who live in Port Hedland.

The HRA says that a small number of people in Port Hedland are expected to be at increased risk to the types of adverse health effects commonly associated with dust. It does not mean that people will be effected, just that the chance of being effected is higher in the areas of Port Hedland with the highest dust levels.

What does the HRA say about $\text{PM}_{2.5}$?

- The HRA shows that $\text{PM}_{2.5}$ did not exceed the national standard of $25 \mu\text{g}/\text{m}^3$ per year except during periods when brushfires in the region affected the whole of Hedland.

Are Port Hedland residents at risk of greater health effects from dust than the rest of the population?

The risk to health from dust - both PM_{10} and $\text{PM}_{2.5}$ increases with increasing concentration – this is true regardless of where people live. As yet, there is no definitive evidence that PM_{10} in Port Hedland is any more or less harmful than PM_{10} in large urban centres.

Areas of Port Hedland with increasing proximity to the port experience frequently high dust events ($\text{PM}_{10} > 70 \mu\text{g}/\text{m}^3$) it is therefore logical that people living in this environment would be at greater risk than people living in less dusty areas of Port Hedland.

Is all of Port Hedland affected by high concentrations of dust all the time?

Dust concentrations increase closer to the Port. It is important to remember that the concentration of dust varies throughout the day and night irrespective of location. On any given day (& night) the dust levels in any one location including the West End can be below recommended guidelines for long periods of time.

What is my risk?

A HRA of this type does not measure individual risk. It measures population risk.

The best way to learn about your risk or your family's risk is to talk to your doctor about your level of risk. Everybody reacts differently to dust; some people react slight differently while others react very much differently. This difference depends on your genetic predisposition, underlying health and age, whether you smoke as well as the level and characteristics of dust.

For most healthy individuals, health effects range from no symptoms to subtle, reversible and manageable symptoms such as cough, sneeze, watery eyes and runny nose. Effects become more pronounced as dust levels increase and symptoms may include wheeze, asthma-like symptoms, cough persisting more than a few days and chest tightness.

The general scientific consensus is that years of continued exposure to elevated dust adversely will affect most people in some way. Therefore, it is important the government focus be on reducing exposure for all people (meaning the population).

What can I do to reduce my risk ?

Reducing your risk means reducing your dust exposure. The Health Department recommends the following precautions:-

- Understand your risk by discussing your health with your doctor.
- If taking medicines for respiratory conditions especially asthma and angina, ensure you don't run out.
- Kick the nicotine habit if you smoke.
- Ditch air fresheners, room deodorisers, aerosol sprays generally, plug-in-scented oils and candles – all these increase PM₁₀ and more importantly PM_{2.5} inside your home.
- Check out the local dust levels in your area here - <http://www.phicmonitoring.com.au/> -
 - when the dust level is below 70 µg/m³ open the doors and windows to flush out stale air.
 - If you have asthma the lower the dust concentration the better; understand your triggers and be aware that even very low dust levels may affect you.
- When dust levels exceed 70 µg/m³, close doors and windows.
 - Avoid strenuous exercise especially if you have asthma, diabetes or a breathing-related condition.
- If you have an air conditioning ensure it is well maintained and the fresh air inlet can be turned off when dust levels outside creep up.

- If you work in a dusty environment, your employer is required to provide personal protective equipment to reduce your exposure or ensure your work space is dust controlled.

What can be done reduce the population risk?

Reducing long term exposure to high concentrations of dust for all people is important; management strategies include:-

- Controlling density of residential developments which encourages low density development in areas subject to frequent dust exceedances.
- Restricting residential development in highest impacted areas subject to frequent dust exceedances.
- Encouraging commercial and residential building design and maintenance to limit dust penetration while maintaining clean air circulation.
- Favouring short term occupancy such as hotel, holiday units over permanent occupancy.
- Providing a risk-based regulatory framework that ensures strong licencing and compliance practices of industrial emissions.
- Encouraging local government to embrace a strong greening program in areas where people live to reduce the amount of dust available for recirculation.
- Encouraging industry partnerships to support a strong greening program in areas where people live to reduce the amount of dust available for recirculation.

This document can be made available in alternative formats on request for a person with a disability.

© Department of Health 2016

Copyright to this material is vested in the State of Western Australia unless otherwise indicated. Apart from any fair dealing for the purposes of private study, research, criticism or review, as permitted under the provisions of the *Copyright Act 1968*, no part may be reproduced or re-used for any purposes whatsoever without written permission of the State of Western Australia.