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Review of the National Pollutant Inventory

NSW Minerals Council Submission

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The NSW Minerals Council (NSWMC) is the peak industry association representing the NSW minerals industry, including mining operations and associated infrastructure that are required to report emissions under the National Pollutant Inventory (NPI).

The review of the NPI provides an important opportunity to improve the NPI to ensure that the significant resources industry dedicates to NPI reporting contributes to a valuable dataset that properly informs industry, government and community.

While NSWMC believes that the NPI has the potential to be a valuable source of environmental data, it is currently failing to meet this objective for a range of reasons. The *Review of the National Pollutant Inventory Discussion Paper* (Discussion Paper) touches on several of the industry's main issues, which NSWMC has expanded on below along with a series of recommendations that would deliver a more valuable inventory and better understanding of its roles and limitations.

The NPI does not currently provide an accurate picture of national emissions

The fundamental problem with the NPI is that it does not present a complete and sufficiently accurate picture of emissions from all sources. This limits the value of the NPI and has the potential to confuse what can already be a complex dataset to interpret.

A large proportion of emissions are not captured in annual reporting

The NPI NEPM legislation requires the States and Territories to prepare their diffuse emission inventories. Diffuse sources include mobile sources (motor vehicles, ships, aircraft), non-industrial sources (e.g. household activities, bushfires, windblown dust) and commercial sector sources (e.g. small printers or bakeries).

These emissions were originally estimated for the 1998/99 reporting year and then sporadically updated by the States and Territories as described in the Discussion Paper (pg. 56) - in stark contrast to the annual reporting required by NPI reporting facilities.

Without updated annual emissions from diffuse sources, the aggregated emission inventory does not represent a complete picture of total emissions. This is a significant limitation when trying to understand and interpret the dataset.

Furthermore, the NPI website does not clearly explain the difference in reporting arrangements between NPI reporting facilities and diffuse sources. As noted in the Discussion Paper (pg. 57), the NPI Data Portal sources tab lists all diffuse sources as being reported in 1999, regardless of when they were updated. Further interrogation of the data in the summary tab adds more confusion as many dates are provided with multiple years of emissions.

It is inequitable that licensed industrial facilities have met their commitments to report annually, while all other emission sources - some significant - are updated very rarely. Together with the NPI website

complexities, the result is an incomplete picture of annual emissions that potentially skews information on the significance of different pollution sources (recognised p36 Discussion Paper).

$PM_{2.5}$ – A Case Study

Reviewing the NSW 2017/18 $PM_{2.5}$ emission inventory, the NPI data indicates that 100% of the state's emissions originate from industry, of which 45% are from coal mining.

The inventory contains no data on emissions from diffuse sources, such as motor vehicles (a known dominant source of $PM_{2.5}$ emissions) or from household activities, such as domestic wood heaters (another known dominant source of $PM_{2.5}$ emissions). The inventory also does not include any biogenic or natural $PM_{2.5}$ emissions.

Alternatively, CSIRO cites that only 10% of $PM_{2.5}$ emissions are from man-made sources and 90% are from biogenic and natural sources[1]. This means that users of the data are potentially being led to believe that mining is responsible for 37.5% of the total $PM_{2.5}$ emissions, when in reality it could be less than 3.75%, based on the CSIRO citation.

The NPI data are thus an unrealistic and misleading representation of fine particulate matter emissions. This is concerning as since the NPI is intended to be a reliable and trusted government resource and fine particulate matter is one of the most commonly studied and reported emissions in Australia. There is the potential that other substances may also be poorly represented in the NPI data.

Exempt industries can have a large impact

It is understood that the facilities listed for exemption emit NPI substances, but are not required to report as it may be too much of a regulatory burden to the industry and they are a sufficiently low risk to the environment.

While this approach to exemptions is good in theory, in practice it is inherently flawed as significant emissions of public concern can come from such sources. Emission sources like petrol stations and dry cleaners exist in urban environments and may represent a large portion of the urban public exposure as opposed to regionally located industries.

The *Sydney Particle Composition Study*[2] cites that secondary sulfates are from fuel combustion (often heavy industrial vehicles), but does not discuss the role of ammonia emissions in its generation. To enable the formation of secondary sulfates, two moles of ammonia are required for every mole of SO_2, or 1.9 times more mass of SO_2 relative to ammonia.

The current NPI inventory indicates that the NSW ammonia emissions are 84,000 tonnes per annum while SO_2 emissions were tenfold greater at 890,000 tonnes per annum. This indicates that the only method to reduce secondary sulfate is thus to reduce ammonia emissions (i.e. the limiting precursor to secondary sulfate formation).

Agriculture is a significant contributor to regional ammonia emissions inventories. Without this source in the NPI inventory, the relationship between ammonia and SO_2 to form secondary sulfate is not well articulated and thus may be misconstrued.

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[1] https://research.csiro.au/static/airquality/smoke-and-fire/

[2] https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Air/sydney-particle-characterisation-study-ansto-epa.pdf

There are limitations to the accuracy of emissions estimations

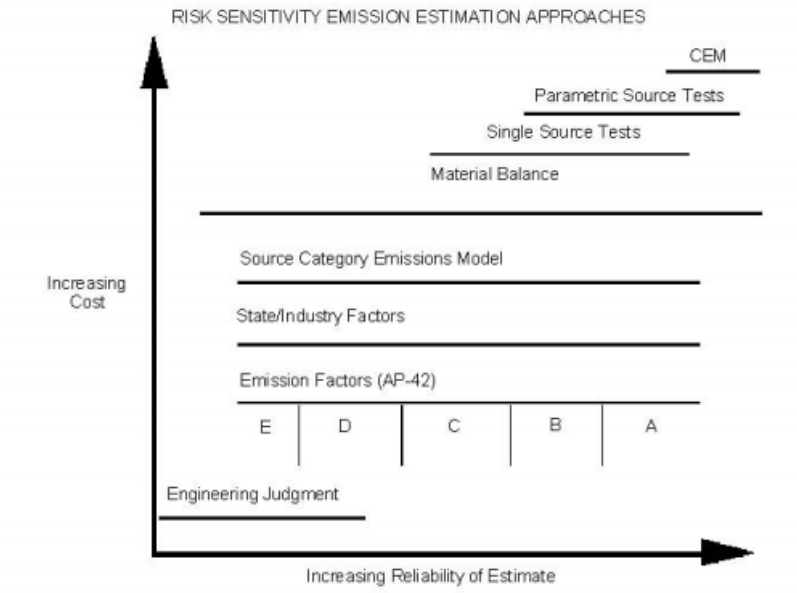
The accuracy of the NPI is affected by the fact that some emission sources are difficult to quantify; some emission estimation manuals have errors or are out of date; and that there is a range of estimation techniques available to reporting entities for the same activities.

The NPI emission estimation manuals (EETMs) are commonly based on international literature and Australian studies of emission sources. In the case of mining fugitive dust emission factors, they are largely based on decades-old research from the United States. The conditions under which these emission factors were developed are quite different from Australian conditions and contemporary mining practices.

As noted in the Discussion Paper (pg 53), the NPI emission estimation manuals are updated periodically, but not on a regular basis. The updates have resulted in varying degrees of changes in the emissions estimates. These updates have not fixed obvious errors in existing manuals, for example the NPI EETM for Mining v3.1 still lists an equation error for bulldozing TSP emissions (the power of 1.4 instead of 1.3) and the manual lists paved roads as 100% controlled, when in reality there are emission factors for paved roads which can be higher than well maintained unpaved roads.

The NPI EETMs do not comment on the accuracy of the emission estimation methods. If the methods are selected from the US EPA AP-42 Compilation of Emission Factors, then the accuracy of the methodology are defined on an A to E rating (A – Excellent, B – Above Average, C – Average, D – Below Average, E – Poor). This type of rating system provides context for the emissions estimate, which is important when evaluating what the total emission estimates mean.

The NPI manuals describe several methods for estimating emissions from sources. These methods include emission factors, direct measurement, mass balance, engineering judgement and other approved alternative methods. The figure below is from the US EPA AP-42 *Compilation of Emission Factors – Introduction* (https://www3.epa.gov/ttnchie1/ap42/c00s00.pdf). This figure shows varying methods for estimating emissions and their A – E accuracy rating against the general costs.



With the variety of methods available, facilities undertaking similar actives may be reporting the emissions differently. These differences make it difficult to compare one facility to another directly.

Fugitive emissions (e.g. windblown dust) are inherently difficult to estimate given the wide range of factors that can influence emissions (e.g. material types, meteorological conditions, material handling practices etc) (recognised on p36 Discussion of the Paper). Current emission estimation techniques are based on overseas studies that are in some cases decades old and are generally acknowledged to overestimate emissions. The mining industry has recognised these limitations and, through the Australian Coal Industry's Research Program (ACARP), has commissioned studies to understand if the NPI manuals accurately represent Australian coal mining emissions (e.g. Project C26024). In general, these studies find that the NPI methods over-predict total emissions. The industry is progressing work to validate these emission estimation methods and looks forward to working with the NPI team to have these adopted in future.

The Discussion Paper (pg 39) states that 64% of government respondents used alternative data sources for pollution data, essentially because of the limitations of the NPI. Similarly, the vast majority of industry only uses the NPI for regulatory reporting purposes. These are fairly clear indicators that the accuracy and completeness of the inventory needs to be improved for it to be valuable in policy work, benchmarking and tracking performance.

Accuracy of facility address in NPI database.

The NPI reports emissions based on a facility address. For facilities that operate many small sources across a very large area, the collation of the emissions to one location will result in an overestimate of emissions at that location. Often the one location is a facility office located within a community, whereas the emission sources are, in reality, located in rural, remote locations. There is currently no way to address this type of location error in the online NPI database.

Emissions estimations alone are not a reliable indicator of environmental or community impacts

While emissions inventories like the NPI have a role to play in environmental management, they are only one of several types of environmental data and there is often much more accurate and relevant environmental data available to inform decision-making. Putting aside the inherent limitations to the accuracy of some emission estimations such as fugitive dust, emissions alone are a poor indicator of impacts.

A given quantity of particulate emissions in the mining sector will generally have a much lower impact than the same quantity of emissions from a source in an urban area due to the much greater distances between mining operations and population centres. Some dust emissions from mining projects will not even leave the site boundary and/or buffer lands or will fall on properties owed by the mining operation, whereas smaller, less regulated industries and diffuse emission sources may be located directly within the population centres.

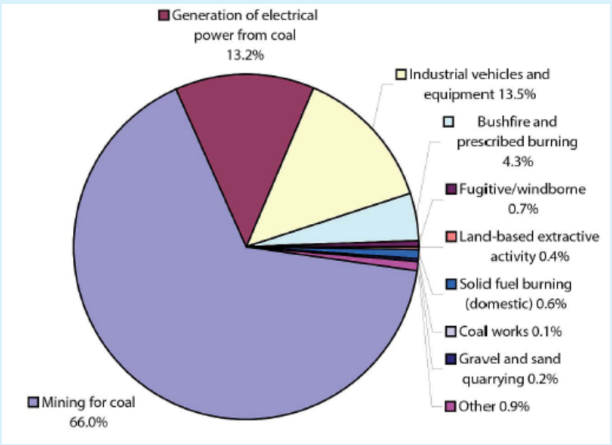
Considering this, simply ranking emission sources based on quantities of emissions can be misleading as to which sources should be of most concern. Most industrial, and particularly mining, operations are located in rural locations away from large population centres. However, smaller, less regulated industries and diffuse emission sources may be located directly within the population centres. The importance of emission source needs to consider both the quantum of emissions and their proximity to receptors. Governments should provide more contextual information when NPI data is reported to improve community understanding, e.g. by focusing on a selection of pollutants or regions of known community interest.

Case Study – Upper Hunter $PM_{2.5}$ Emissions Estimates versus Population Exposure

The two charts below demonstrate the significant difference between estimated emissions of $PM_{2.5}$ from both coal mining and domestic woodheaters, and the resulting population exposure to $PM_{2.5}$.

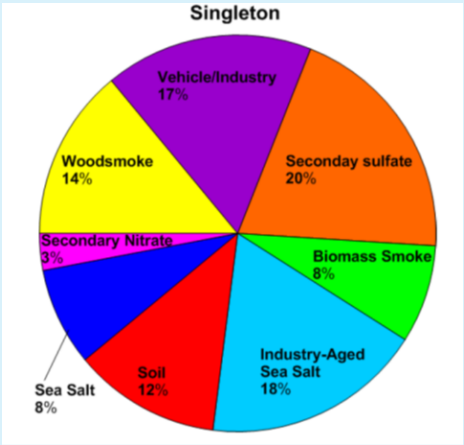
The NSW EPA's 2008 air emissions inventory estimates that fugitive dust emissions from mining make up 66% of $PM_{2.5}$ emissions in the Upper Hunter region, while domestic solid fuel burning makes up 0.6% of emissions. However, these figures are vastly different to the actual measurements of population exposure to $PM_{2.5}$ taken by the CSIRO in its particle characterisation study conducted in 2012. The particle characterisation study measured 'soil' (which includes fugitive dust emissions from mines as well as other sources of soil) making up 12% of $PM_{2.5}$ exposure in Singleton while smoke from domestic woodsmoke comprised 14% of $PM_{2.5}$[3]. Given the significant increase in coal production between 2008 (when the air emissions inventory was compiled) and 2012 (when the CSIRO undertook sampling for its study) one could assume that the EPA's estimated $PM_{2.5}$ emissions from coal mining would be even greater for 2012, further broadening the difference between estimated emissions and exposure.

EPA estimated $PM_{2.5}$ fugitive dust emissions from coal mining in the Upper Hunter – 66%



Source: EPA 2008 Air Emissions Inventory Upper Hunter

CSIRO measurement of $PM_{2.5}$ soil particles in the Upper Hunter – 12%



Source: CSIRO 2013 Particle Characterisation Study

The significant differences between emissions estimates and population exposure could be explained by a) inaccuracies in the air emissions inventory and/or b) the relatively larger distances between mines and the major population centres. In any case, emissions inventories, while part of the picture, do not provide an accurate indication of population exposure.

[3] The corresponding figures for Muswellbrook in the CSIRO study were: soil – 11% woodsmoke – 30%.

Recommendations

Reduce the frequency of reporting for reporting facilities

- There is a strong argument that the frequency of reporting can be reduced while maintaining the objectives of the NPI.
- When assessed at an industry, regional, state or national scale, annual emissions are unlikely to fluctuate outside the margin of error and it is unclear what benefit annual reporting provides in this context.
- The NSW Air Emissions Inventory, prepared by the NSW EPA, is updated every 5 years, and is used for similar purposes to the NPI but has much broader coverage. This is a sufficient reporting frequency to inform policy development, identify trends, and inform communities about emission sources.
- For individual facility emissions there may be many reasons emissions to change from year to year that are unrelated to environmental performance - e.g. equipment shutdowns; changes in production levels; establishment of a new facility etc. If there are specific pollution issues associated with a facility, in all likelihood there will be other reporting and communication mechanisms in place to more regularly update regulators and the community on performance.
- It is clear that governments have been unable to regularly update diffuse emission estimates on a regular basis, and certainly not annually. NSWMC believes a 2-5 year reporting frequency is sufficient for meeting the objectives of informing government policy development and providing communities with information on emissions. A reduced frequency of reporting would allow a greater focus on quality of the information provided, including supporting contextual information such as data analysis and refinement of estimation techniques.

Improve reporting of diffuse emission sources

- Governments should update the NPI database to a consistent base year for all diffuse emission sources and commit to updates at a defined frequency.
- Highly variable diffuse emission sources (i.e. bushfires and windblown dust) should be updated annually to provide the most accurate context, including observed climatic conditions for the emissions inventory.
- Both natural and anthropogenic $PM_{2.5}$ emissions should be updated to include all diffuse emission sources.

Better communicate the NPI data with supporting contextual information

- Each time the NPI data is reported it should be accompanied by range of communications from the Commonwealth and State/Territory environment agencies to provide supporting contextual information and ensure the purpose and limitations of the NPI are understood.
- The communications should include context regarding the difference between emissions and exposure to assist the public in understanding risks. If possible, linking the NPI website with the ambient concentrations data for each state, may help explain the differences between emissions and exposure.

Develop and resource a program of updates to the emission estimation technique manuals

- A program of updates to the NPI manuals should be undertaken in consultation with industry and expert working groups. Updates should be prioritised, for example, based on environmental risk, known issues with estimation methods, or areas of community interest.

- Emission estimation technique manuals should be updated based on empirical data collected for Australian industry activities.
- During the reviews of the manuals, opportunities to achieve greater consistency in estimation techniques used by reporting facilities should be explored, as recommended in the NSW EPA's *Review of Coal Fired Power Stations Air Emissions and Monitoring*[4].

Provide more resources for the NPI administrators

- The Discussion Paper (pg. 60) demonstrates that the program is well underfunded compared to international programs. The effect of this is that the outcomes from prior reviews of the NPI have still not been implemented, diffuse emission sources are not updated, supporting contextual information has ceased being provided and errors and updates to emission estimation manuals have not been addressed.
- It is clear that more funding is required to make the NPI effective. However, this funding should not be sourced from the reporting facilities since they already incur the majority of the cost burden for reporting emissions as well as paying licence fees to state agencies. The funding should be sourced from the Commonwealth and State budgets.

Reduce the reporting burden

- The online reporting system is very laborious and takes a long time to save changes. The system also asks the same validation questions year on year. If the system could be 'smarter' and learn from repetitive answers to the validation questions, this could reduce the burden of reporting.
- Opportunities to streamline reporting with other reporting requirements (e.g. State approval requirements or NGERs) should be explored.

NSW Minerals Council

[4] https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/air/18p0700-review-of-coal-fired-power-stations.pdf?la=en