Planning Assessment Commission

NSW GOVERNMENT

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Mr Marcus Ray
Deputy Secretary Planning Services
Department of Planning and Environment
23-33 Bridge Street
Sydney NSW 2000

23 September 2015

Dear Mr Ray Marcus

Subject: Request for Further Information on the Warkworth and Mount Thorley Continuation Projects

I refer to the request from the Minister for Planning, the Hon. Rob Stokes MP, to the Planning Assessment Commission (the Commission) dated 13 August, to carry out a second review of the Warkworth and Mt Thorley Continuation Projects.

As requested by the Minister, the Commission held a public hearing on the projects on 7 and 8 September 2015. Based on the verbal submissions heard during this hearing and other written submissions that have been made to the Commission as part of the second review, a number of issues have been raised that the Commission believes need further consideration.

The Commission has identified four key issues that require further consideration, including:

- the consultation process with relevant Aboriginal stakeholders and potential impacts on Aboriginal cultural heritage sites;
- the adequacy of the Social Impact Assessment (SIA) provided in the Environmental Impact Statement (EIS);
- the proposed approach to rehabilitation of the Warkworth Sands Woodland ecological endangered community (EEC); and
- the cumulative impacts of the projects, particularly in relation to final voids.

These issues are described in detail below, including specific requests for further information to be provided by the Department of Planning and Environment (the Department).

As discussed in our telephone conversation on 21 September 2015, the Commission cannot complete its review of the Warkworth and Mt Thorley Continuation Projects until the Department has provided the further information requested below.

1. Aboriginal Cultural Heritage

At the public hearing, the Commission met privately with a group of people claiming to represent the Wonnarua Aboriginal group. The Commission was informed that the group is currently in the process of seeking to register a native title claim within the project area. This group claimed that the Applicant had not responded to numerous requests for a meeting with them and has not adequately consulted with the relevant Aboriginal stakeholders about potential impacts to Aboriginal cultural heritage sites. (The Commission is expecting to receive formal written advice about the group's concerns by Friday 25 September 2015.)

The Commission has received a letter from the Applicant dated 11 September 2015, relating to a number of issues that were raised at the public hearing. This letter provides some information relating to the Aboriginal cultural heritage issues raised by the Wonnarua group, and is provided as **Attachment 1**.

The Commission has also received a letter from Tocomwall Pty Ltd dated 16 September 2015, which purports to represent the Plains Clan of the Wonnarua People (PCWP). Tocomwall claims that the Applicant has not adequately consulted with the PCWP about the cultural values within the project area and not provided a copy of the completed Aboriginal Cultural Heritage Assessment Report to the PCWP. A copy of the letter from Tocomwall is provided as **Attachment 2**.

The Commission requests that the Department considers the issues described above and provides further information, particularly in relation to:

- the adequacy of the consultation with all relevant Aboriginal stakeholders, with reference to the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (Office of Environment and Heritage, 2010);
- the adequacy of the Aboriginal Cultural Heritage Assessment Report in the EIS, including potential impacts to Aboriginal cultural heritage sites; and
- the process by which members of the local Aboriginal community will be involved in the protection and restoration of cultural heritage.

2. Social Impact Assessment

The Commission has received a submission from Dr Michael Askew and Dr Louise Askew dated 8 September 2015 relating to the methodology used in, and the findings of, the SIA. The Askews are both social environmental researchers and were engaged by the Applicant to undertake data collection and analysis for the SIA. In their submission, the Askews describe a series of purported "*inaccuracies*" within the final SIA and conclude that it is "*evident that the social impacts from the proposed project would significantly outweigh the socio-economic opportunities if the projects were not to proceed*". A copy of their submission is provided as **Attachment 3**, which is confidential and should not be made publicly available.

The Commission has also received a letter from the EMGA Mitchell McLennan, which was the consultant commissioned to undertake the SIA for the Applicant. This letter was prepared in response to a small portion of the Askew's submission, which was not publicly available in full at the time. A copy of this letter is provided as **Attachment 4**.

The Commission requests that the Department considers the issues described above and provides further information, particularly in relation to the concerns raised by the Askews and the adequacy of the SIA.

3. Warkworth Sands Woodland Ecological Endangered Community

A number of verbal and written submissions in the second review have raised concerns about the current status of the Warkworth Sands Woodland on State, Commonwealth and international listings, and the Applicant's proposed approach to the rehabilitation of it. In particular, Dr Stephen Bell raised concern that the proposed regeneration of the Warkworth Sands Woodland EEC would not result in restoration to its original condition but rather the creation of a 'novel ecosystem'. Dr Bell referred to some recent scientific articles about these issues in his presentation, which is provided as **Attachment 5**.

As we are given to understand that all known areas of the Warkworth Sands Woodlands are on land now owned by mining companies, it is particularly important that we be assured that the regeneration arrangements are effective.

The Commission also notes that in its previous review report, it recommended that the conservation bond in the proposed conditions of consent should be amended to properly reflect the estimated cost of the proposed regeneration works to ensure that these works are able to be undertaken. The Commission believes that the Department should reconsider the bond amount that is currently recommended in the proposed conditions in order to reflect the issues raised by Dr Bell.

The Commission requests that the Department considers the issues raised above, and provides further information, particularly in relation to

- the current status of the Warkworth Sands Woodland in State, Commonwealth and international listings;
- the Applicant's proposed approach to rehabilitation of the Warkworth Sands Woodland EEC, with particularly reference to the concerns raised by Dr Stephen Bell; and
- the appropriate amount for the conservation bond in the proposed conditions of consent.

4. Cumulative Impacts

A number of verbal and written submissions in the second review have raised concerns about the cumulative impacts of the Warkworth and Mt Thorley Continuation Projects, and other coal mining projects in the region. The Commission notes that an assessment of the cumulative impacts of the projects was required in the Secretary's Environmental Assessment Requirements.

In relation to the cumulative impacts of final voids, the Commission recommended in its previous review of these projects that "*as a matter of priority ... a study be undertaken by the Government to establish a policy position on voids for future mining projects and mine expansion projects*". The Commission notes that the Department provided a response in its Addendum Report that the NSW Government is "*considering a range of matters to strengthen the regulation of mining operations in NSW, including the nature and scale of final voids associated with open cut coal mines in the Hunter Valley.*"

In relation to cumulative air quality impacts, the Commission notes that the previous judgement of the Land and Environment Court was critical of the recommended conditions of consent requiring the Applicant to only employ "*all reasonable and feasible avoidance and mitigation measures*" to meet the air quality criteria. The Commission still considers there is scope to amend these proposed conditions in such a way that would ensure compliance with the relevant air quality criteria. The Commission also draws the Department's attention to evidence provided at the public hearing about cumulative dust and health impacts, which was drawn from the report on *Coal and Health in the Hunter* (February 2015), and is provided as **Attachment 6**.

Moreover, at the PAC public hearing held on the 7 and 8 September a number of speakers claimed that the projects' environmental assessment inadequately considered the cumulative impact on endangered species, such as the Regent Honey Eater. It was noted that by focusing during the environmental assessment on specific projects in isolation, such as the Warkworth Continuation and Mt Thorley projects, the broader cumulative regional impacts on endangered species from mining are underestimated. These assertions are a concern to the PAC.

The Commission requests that the Department considers the issue of cumulative impacts, and provides further information, particularly in relation to:

- any development in policy, or the strengthening of the regulation of mining operations, to address the cumulative impacts of final voids;
- any potential amendments to the proposed conditions of consent 17-19 that would ensure compliance with the relevant air quality criteria;
- the Department's new compliance monitoring regime in the Hunter Valley; and
- the adequacy of the environmental assessment of the cumulative impacts on endangered species.

I look to forward to receiving further information from the Department in relation to the four key issues described above. If you any questions, please contact Clay Preshaw, Team Leader of the Commission's Secretariat, on 9383 2106.

Yours sincerely

Lynelle Briggs AO
Chair
Planning Assessment Commission

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11 September 2015

Ms Lynelle Briggs AO
Chair – Warkworth and Mount Thorley Determinations
Planning and Assessment Commission
GPO Box 3415
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Dear Ms Briggs

Warkworth Continuation Project (SSD 6464) and Mount Thorley Continuation Project (SSD 6465) – Planning Assessment Commission Public Hearing 2

Thank you for the opportunity to present at the second public hearing for the abovementioned proposals held on 7 and 8 September 2015. We note the public hearing was undertaken by the Planning Assessment Commission (PAC) in accordance with the Minister for Planning's terms of reference dated 13 August 2015.

We would like to take this opportunity to respond to some of the statements made by speakers at the public hearing. Our response is provided below.

Land and Environment Court Judgement

A number of speakers claimed, that with the removal of Clause 12AA from the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP), the merit assessment by the Land and Environment Court (LEC) prevails. This position is legally incorrect.

As advised in our letter to the PAC dated 9 January 2015, the applications made for the proposals were made under changed legislation and policies (including now being determined under a new approval process under the *Environmental Planning and Assessment Act 1979*). A high level summary of the changes to the 2010 application were also provided in this letter. The applications are legally required to be dealt with in accordance with the *Environmental Planning and Assessment Act 1979* and, as they are new proposals, the LEC merit appeal decision has no relevance to their determination given it involved a different project and was determined under different legislative provisions and policies.

Importantly, as outlined in our letter to the PAC dated 2 September 2015, the current proposals are subject to contemporary policies that did not exist at the time of the LEC judgement. Therefore the merits of the proposals need to be considered in light of these contemporary environmental, social and economic standards. Key environmental, social and economic considerations are further discussed below.

Noise & Air Quality

Clause 12AB (3) and (4) of the Mining SEPP specifies cumulative noise and air quality amenity non-discretionary criteria. The cumulative noise and air quality amenity criteria are satisfied for all properties in Bulga Village and the further mining extent would remain 2.6 km from Bulga village.

Under the Voluntary Land Acquisition and Mitigation (VLAM) Policy, one property three kilometres north of Bulga village exceeds project specific noise levels (PSNL) by 5 db(A) and is entitled to acquisition upon request. A total of five properties in Bulga village exceed the PSNL by 3-5 db(A) and are entitled to mitigation measures. Some 95% of properties in Bulga village are below the acquisition/mitigation threshold.

The non-discretionary standards for noise and air quality within clause 12AB (3) and (4) of the Mining SEPP and the VLAM policy were not in place at the time of the LEC and provide contemporary standards for noise and air quality.

As outlined in our letters to the PAC on 31 July 2015 and 2 September 2015, the non-discretionary criteria have been met by the proposals, and this is a clear indication of the acceptability of those impacts, given the Mining SEPP then prohibits imposing any more onerous a standard on such impacts that meet these non-discretionary criteria. The ability to satisfy noise and air quality criteria is a relevant consideration under Section 79C of the *Environmental Planning and Assessment Act 1979*.

Warkworth Sands Woodland

At the PAC hearing, the conservation significance of the Warkworth Sands Woodland (WSW) was suggested to have increased because it may meet some of the criteria for National and International significance listings. This is irrelevant to any determination of the application. It is also important to note that there are numerous other criteria for being listed and it can't be assumed that WSW would meet these criteria.

The current status of the WSW is that it is listed as endangered under the *Threatened Species Conservation Act* 1995 and therefore needs to be considered in this context.

Ecological surveys for species and communities were undertaken in accordance with the NSW Biodiversity Offset Policy for Major Projects. These took account of WSW's current legal status under the *Threatened Species Conservation Act* 1995. The Biodiversity Offset Strategy (BOS) to offset the impact of the proposal, including the clearing of WSW, was certified by the relevant Government agency, the NSW Office of Environment and Heritage (OEH) under Clause 14(3) of the Mining SEPP.

The NSW Biodiversity Offset Policy for Major Projects and the Clause 14(3) certification of the BOS were not in place at the time of the LEC judgment and provide contemporary standards for ecological considerations. This is a relevant consideration under Section 79C of the *Environmental Planning and Assessment Act 1979*.

Economics

The economic assessment was undertaken by Dr Brian Fisher in accordance with the *Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals* which was not in place at the time of the LEC. The economic assessment was peer reviewed by Deloitte Access Economics and found to be broadly appropriate.

The Department of Planning and Environment (DPE) is satisfied the CBA indicates the projects would result in a significant net benefit to NSW of approximately $1.5 billion based on current forecasts.

Dr Fisher has advised that the economic impact assessment of the proposals included a detailed sensitivity analysis using a range of coal prices and exchange rates which illustrates that the proposals make a significant positive contribution to the NSW economy with a range of $1.2b to $1.8b in net present value terms. A significant portion of the benefits are not affected by coal price. The recent falls in international coal prices have been buffered to an extent by the value of the Australian dollar compared with its US counterpart, the currency in which all of the proposal's coal is sold.

The Australia Institute raised concerns in relation to the quantum of the economic benefits associated with the proposals, as they have done so at the previous public hearing and public meeting.

The significant economic benefits have been widely acknowledged and accepted. In the PAC Review Report, it was stated that:

> *The Commission considers that it is undeniable that the Warkworth Continuation Project will result in significant economic benefits to both the State and the region.*

The DPE in its Addendum Report (May 2015) concluded that the extraction of a coal resource of this size and quality would result in a range of very significant economic benefits to the Singleton Local Government Area. Further, the DPE concluded that the project's benefits outweigh its residual costs and that it is in the public interest and should be approved, subject to stringent conditions.

It is our view that there would be no change to conclusions in the PAC Review Report and DPE Addendum Report as a result of the Mining SEPP amendment. The DPE advised in their letter to the PAC dated 7 July 2015 that the change to the Mining SEPP does not change their position that under Section 79C, the benefits of the development applications outweigh the impacts and maintain their recommendation that the project is in the public interest and should be approved.

The significant economic benefits remain a relevant consideration under Section 79C of the *Environmental Planning and Assessment Act 1979*.

Social

Although there are no new guidelines or policies developed by the State since the LEC judgement, a Social Impact Assessment (SIA) was undertaken in accordance with the Secretary's Environmental Assessment Requirements while addressing key issues identified in the LEC judgement.

The Honourable Chief Judge Preston's approach requires a consideration of the experiential evidence from residents and the objective evidence. The experiential evidence identified by the residents of Bulga and other local communities included impacts on the physical environment, health and well-being, economy, infrastructure and services, community engagement, relationships and governance.

The objective evidence shows that despite the experiential evidence of residents of Bulga, the amenity criteria for the village of Bulga is satisfied in accordance with the non-discretionary standards under the Mining SEPP.

The SIA also identified social impacts on the wider Singleton Local Government Area if the projects did not proceed. These impacts included workers and families moving away from the area due to significantly reduced employment opportunities, increased unemployment and financial difficulties in Singleton and the broader Hunter Valley region, reduced local spending, negative impacts on local businesses, population decline, reduced viability of services such as schools, reduced community life and participation.

The various impacts identified through the SIA were assessed, and where required, strategies to avoid, mitigate, management or enhance opportunities have been developed accordingly.

Although not raised at the public hearing, we were recently approached by the Newcastle Herald with extracts of a submission made to the PAC by Dr Michael Askew and Dr Louise Askew in relation to the SIA. We have provided a copy of these extracts (included in **Attachment 1**) to the consultant firm EMGA Mitchell McLennan (EMM) responsible for preparation of the SIA. Mr Paul Mitchell OAM from EMM has corresponded with the PAC on this matter, a copy of which is included in **Attachment 2**. Mr Mitchell provides context of the Askew's limited role in the SIA, the broader engagement with the local community, the balance of the experiential evidence of residents with the objective evidence from the technical assessments, and reaffirms the conclusions from the SIA.

The DPE Assessment Report (November 2014) found that the Department is satisfied the project would enable significant benefits to be realised, which would outweigh the residual costs of the project for the local community as a whole. The PAC also found in the Review Report (March 2015) that:

> *In balancing the social impacts against the economic benefits associated with the proposal, the Commission has formed the view that the impacts expected as a result of the project are acceptable when compared to the standards and performance measures commonly applied to mining projects in NSW. The continuation of operations and associated employment of approximately 1,300 employees will contribute to the vitality of centres such as Singleton, as well as a continued demand for community services and infrastructure in the area. It does however consider that options exist to ameliorate the impacts of the project on the Bulga community.*

It is our view that the DPE findings and PAC recommendations remain valid following the Mining SEPP amendment and are relevant considerations in the context of Section 79C of the *Environmental Planning and Assessment Act 1979*.

With respect to ameliorating impacts of the project on the Bulga community, the PAC provided a number of options in recommendation 3 of the Review Report (March 2015). While a response to these recommendations was provided by the applicant in a Response to PAC Review Report (EMM, March 2015), the Commissioner's for the PAC determination requested further consideration of tangible community enhancement initiatives in Bulga village, in particular, water and sewerage reticulation for long term sustainability.

We are pleased to confirm recent advancements on the Voluntary Planning Agreement (VPA) with Singleton Council that will deliver the PAC's recommendation for long term enhancement initiatives in Bulga Village, as well as supporting the wider Singleton community.

The VPA contribution plan, as outlined in a meeting with the PAC and Singleton Council on 4 September 2015, now provides for:

1. Bulga Water and Sewerage Projects;
2. Bulga Community Enhancement Projects; and
3. Singleton Economic Development Projects

Further details of the contribution plan are provided in a letter to Singleton Council dated 10 September 2015 (refer **Attachment 3**) including an indicative payment schedule, demonstrating our commitment to bring forward expenditure to facilitate community enhancement initiatives in Bulga Village.

Consultation with Wonnarua Tribal Council (WTC)

A number of speakers asserted that they represented the WTC native title claimant group and were not consulted as part of the Aboriginal Cultural Heritage (ACH) assessment for the Environmental Impact Statement (EIS) and that their views on cultural values were not afforded consideration. A detailed response to these claims is provided in **Attachment 4** and summarised below.

The WTC group is involved in two native title claims (WTC and Ors NC2012/005 and the WTC NC2013/003) neither of which intersects with the proposals. Under the provisions of Section 4.1 of the OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (ACHCRP) Aboriginal people are required to register their interest in being consulted directly with the proponent. The WTC has not registered with Coal & Allied for consultation as an Aboriginal Party for the Warkworth Continuation EIS. However, it should be noted that 10 of the 12 applicants of the two WTC native title claims are registered as Aboriginal Parties (RAP) for consultation with Coal & Allied and were included in the consultation process for the EIS.

Coal & Allied consulted with 83 RAPs (including 10 WTC native title applicants) for the EIS. Broad definitions of what constitutes Aboriginal cultural heritage and their significance were determined in consultation with the RAPs. Aboriginal cultural heritage considered in the assessment for the EIS includes all identified places and values of archaeological, traditional, spiritual, historical or contemporary significance are deemed to constitute cultural heritage. A number of places of significant cultural values were identified by the RAPs and recorded within the Warkworth mining lease area but none were located within the proposed development footprint. The places and areas with particularly significant cultural values that were identified by the RAPs, including the Bulga Bora Ground and associated cultural landscape, are all located within the 700ha Wollombi Brook Aboriginal Cultural Heritage Conservation Area which is to be protected in perpetuity.

The adequacy of the Aboriginal cultural heritage values assessment for the EIS has been assessed by both OEH and the DPE. The OEH in its submission of 8 August 2014 noted its support for Coal & Allied's approach to addressing cultural values at a landscape level. Furthermore, in OEH's consideration of the cultural heritage values, impact assessment and management outcomes of the EIS it is stated that it 'strongly supports all the management commitments proposed with respect to Aboriginal cultural heritage for the proposed Warkworth Continuation Project 2014' and that it had 'no further comments or requirements for Aboriginal cultural heritage within the extension footprint'.

In the DPE Secretary's Environmental Assessment Report it is stated that both the Department and OEH are satisfied that the Aboriginal heritage assessment and consultation for the project has been undertaken in accordance with applicable guidelines. Overall, the DPE was satisfied the project's residual impacts are unlikely to have a significant impact on the Aboriginal heritage values of the region. The statements made by both OEH and DPE confirm that the Aboriginal cultural heritage values and impact assessment for the WCP EIS was adequate and appropriate.

Coal & Allied has not received any correspondence or any other direct contact from Mr Taggart nor the WTC group to register for consultation. Furthermore Coal & Allied recently wrote to Mr Taggart on 12th August 2015 inviting him to register his interest as an Aboriginal Party for consultation and to attend a meeting of RAPs held on 3rd of September. Coal & Allied did not receive a reply nor did Mr Taggart attend the RAP meeting. However, another WTC native title applicant was present at the RAP meeting and did not raise any concerns about the EIS.

Conclusion

The NSW DPE recently released a report *Review of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*(September 2015) which provides useful context of the role of the economic significance of the resource within the Mining SEPP before it was amended. An extract of this context is reproduced below.

> *Clause 12AA directs the consent authority to consider the relative significance of the resource. This includes considering the economic benefits of developing the resource, both to the State and the region in which the development is proposed to be carried out. Clause 12AA also makes the significance of the resource the principal consideration of the consent authority under the Mining SEPP.*
>
> *A key foundation of the NSW planning system is that every development application is assessed on its merits. This includes a balanced assessment of the likely impacts of that development, including economic, environmental and social, impacts, consideration of the principles of ecologically sustainable development, and whether an application is in the public interest. These requirements are contained within sections 5 and 79C of the Environmental Planning and Assessment Act 1979.*
>
> *Despite this, community and environment groups have raised concerns that clause 12AA results in economic factors being given greater weight over other considerations in the assessment process.*

As outlined above, and in previous correspondence to the PAC, Clause 12AA was only relevant to the consideration of the proposals under Part 3 of the Mining SEPP.

Therefore removal of the Clause 12AA from the Mining SEPP does not change the previous outcomes from the first PAC review or the DPE Assessment/Addendum reports as the economic benefits of the project continue to be a relevant consideration under Section 79C. These outcomes are that the benefits of the proposals outweigh the costs, that the proposals are in the public interest and that they can be approved under Section 79C of the *Environmental Planning and Assessment Act 1979*.

We look forward to the PAC completing its review by 21 September 2015.

If the PAC requires any further information or clarification, please do not hesitate to contact Anthony Russo, Manager - Projects Approvals on 07 3625 4823.

Yours sincerely

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Enc.

Attachment 1	Extracts of submission by Dr Michael Askew and Dr Louise Askew to the PAC.
Attachment 2	Letter from Mr Paul Mitchell OAM in relation to Social Impact Assessment
Attachment 3	Letter to Singleton Council in relation to the VPA Contribution Plan
Attachment 4	Aboriginal cultural heritage consultation process

Attachment 1
Extracts of submission by Dr Michael Askew and Dr Louise Askew to the PAC

NSW Planning Assessment Commission
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Attention: Mr Clay Preshaw
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08 September 2015

**Submission to the Planning Assessment Commission –
Warkworth Continuation Project and Mt Thorley Continuation Project**

Dear Commissioners,

The following submission raises key issues regarding the Warkworth Continuation Project and the Mt Thorley Continuation Project currently being assessed by the Planning Assessment Commission (PAC), under the new provisions of the draft State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment 2015.

We (Dr Michael Askew and Dr Louise Askew) are qualified social and environmental researchers who have demonstrated experience in undertaking Social Impact Assessments (SIAs), particularly for the resources sector. We were the primary social researchers who undertook the data collection and analysis for the Social Impact Assessments for the proposed Warkworth and Mt Thorley Continuation Projects; however, we were not involved in the development of the final version and submission of the SIAs to the Department of Planning and Environment as part of the Environmental Assessments for the projects.

We fully respect and uphold the confidentiality requirements under which we originally conducted the research for these SIAs. As a result, this submission does not contain any information that is not publicly available in the Environmental Assessment and SIA reports (or elsewhere).

The submission addresses what we believe, in our own personal and professional opinion, to be problematic inaccuracies in the final version of the Social Impact Assessments for the projects. This submission also addresses significant shortcomings in the NSW Department of Planning and Environment Secretary's Environmental Assessment Report (2014) for the projects.

1.0 Social Impacts Assessments

1.1 SIA requirements

- The Department of Planning and Environment Secretary's Requirements (22 May 2014) specified that the Environmental Assessment should include: "an assessment of likely social impacts of the development including perceived impacts paying particular attention to Bulga". We argue that the social impacts have not been rigorously assessed and the perceived social impacts are not explored or illustrated in the detail required as part of typical and adequate SIA practice (see also section 1.6 of this submission). The SIAs are inconsistent with the Secretary's Requirements given that there is:

3.0 Concluding Comments

What is evident from the published reports, assessments and NSW Land and Environment Court findings, along with our own personal knowledge of the affected areas, is that the social impacts from the proposed projects would significantly outweigh the socio-economic opportunities if the projects were to proceed. Surrounding communities, like Bulga, are especially vulnerable to disruption, degradation and displacement from proximate extractive projects; at the same time, they hold the key to successful transition to the economies of the future (through agriculture, entrepreneurism, new and decentralised energy generation technologies, etc). The proposed projects represent a direct and real threat to the future of Bulga and surrounding communities and the ongoing health and sustainability of the region.

We trust that you, the Commissioners, will make the right and just decision regarding these projects.

Kind Regards,

Dr Michael Askew and Dr Louise Askew

Attachment 2
Letter from Mr Paul Mitchell OAM in relation to Social Impact Assessment

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10 September 2015

Ms Lynelle Briggs
Chairperson
Planning Assessment Commission
Level 13
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Re: R034/15 and R035/15 - response to matters raised at hearings

Dear Ms Briggs

EMGA Mitchell McLennan Pty Limited (EMM) has been made aware of a submission presented to the NSW Planning Assessment Commission (PAC) in response to the request for a review of the Warkworth Continuation Project (SSD 6464) and Mt Thorley Continuation Project (SSD 6465) by the NSW Minister for Planning. We understand that this submission was prepared by Michael and Louise Askew who were members of the social impact assessment (SIA) project team. Whilst EMM has not seen the content of the submission, this letter presents the following relevant matters regarding the SIA's method and findings to the PAC.

- The SIA is an EMM document and EMM stands by its findings and maintains that it accurately reflects the community consultation undertaken. The SIA has been produced by a highly experienced team who completed the work with professional skill and diligence.

- The method for the preparation of the SIA was consistent with leading practice and the approach taken by the NSW Land and Environment Court (LEC) which requires consideration of the objective data ('concrete likely effects of the proposed development') and the experiential evidence ('subjective fear or concern') from residents.

- Michael and Louise Askew's principal contribution to the SIA was background research, initial consultation and reporting of these consultation activities. These tasks were undertaken in the early phases of the SIA process and their involvement in the project ceased during preparation of the technical studies, well in advance of finalisation, and incorporation of results into the SIA.

No guidelines or policies have been provided by the State since the LEC judgment on Warkworth Mine. The method for the preparation of the SIA followed leading practice, including that in the Community Development Toolkit (2012) prepared by the World Bank specifically for addressing social issues associated with the mining sector.

The SIA involved gathering comments from a wide range of stakeholders and these have been fairly and objectively reported in it. The SIA was undertaken in accordance with the Secretary's Environmental Assessment Requirements but also addressed the issues identified in the LEC judgment. The SIA has been deemed adequate by both the NSW Department of Planning and Environment (DP&E) and the PAC.

As noted above, the Chief Judge's approach to SIA (par. 430 of the LEC judgment) requires consideration of the objective data ('concrete likely effects of the proposed development') and the experiential evidence ('subjective fear or concern') from residents. The objective data shows that despite the experiential

evidence of residents of Bulga, the amenity criteria for the village of Bulga are satisfied in accordance with the mandatory requirements listed in clause 12AB of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP).

The SIA used objective data and findings of technical studies - such as noise and air quality assessments - plus Australian Bureau of Statistics (ABS) census data showing that Bulga has:

- a population that is growing compared to those in Singleton, Muswellbrook and Upper Hunter local government areas (LGAs);
- a low unemployment rate comparative to that of NSW;
- higher median income comparative to that of Singleton, Muswellbrook and Upper Hunter LGAs and NSW; and
- no noticeable effect on property prices during the preparation, lodgement and assessment of the Warkworth Extension Project 2010 over a four year period from 2008 to 2012.

These factors show that established and new residents of Bulga find it an attractive residential location offering good amenity and situated to take advantage of job opportunities in the locality. Further, the EIS shows that these conditions will not change materially as a result of the projects.

Social impact issues identified by the residents of Bulga were impacts on the physical environment, health and well-being, economy, infrastructure and services, community engagement, relationships and governance. Consistent with leading practice, the SIA considered social impacts if the projects did not proceed. Issues identified included workers and families would need to move away from area, unemployment and financial difficulties, reduced local spending, decreased local business, population decline, reduced viability of services such as schools, and reduced community life and participation. These stakeholder perceived social impacts were considered together with the outcomes of the technical studies such as noise and air quality in the assessment of the projects.

Noise and air quality goals/criteria established under government policies provide benchmarks set to protect the community against adverse effects, and generally reflect current Australian community standards for the protection of health and against nuisance effects. Criteria are applied for all of NSW, irrespective of industry and location. Therefore, compliance with these would suggest that general health and amenity are being protected.

Maintaining compliance throughout the life of the projects is reflected in commitments made under the proposal and will continue to be evidenced by the outcomes of monitoring and auditing against noise and air quality criteria with the results publically available on Rio Tinto Coal Australia's website.

All of the Mining SEPP's non-discretionary standards are met for the village of Bulga and all surrounding privately-owned properties, with the exception where the cumulative annual average criteria is exceeded for two properties northwest of Warkworth Mine which are already afforded acquisition rights by neighbouring mines.

It is important to recognise that the projects have incorporated design and operational improvements compared to the previous Warkworth Extension Project. These were developed with consideration to, amongst other matters, feedback received during stakeholder engagement for the projects and the LEC judgment. These improvements were designed to avoid, mitigate and manage the identified impacts to achieve an appropriate balance between environmental, social and economic impacts and maintaining the viability of the mine.

As noted in the response to submissions reports for both the Warkworth Continuation Project (Section 7.2.7(ii)(a) page 315) and Mt Thorley Continuation Project (Section 7.2.4(ii)(a) page 190), Michael Askew

and Louise Askew were members of the SIA study team who principally undertook the one-on-one consultation. This consultation was undertaken in the early phases of the SIA process and, as noted above, their involvement in the project ceased during the preparation of the technical studies, well in advance of their finalisation, and incorporation of results into the SIA. While their views are acknowledged, they do not reflect the objective reference points given outlined above and presented in the SIA.

In summary, the comprehensive SIA prepared by EMM demonstrates that, on balance, the social effects of the proposals would be positive. EMM stands by the SIA and its conclusions entirely.

Yours sincerely

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Director
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Attachment 3
Letter to Singleton Council in relation to the VPA Contribution Plan

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Private and confidential

10 September 2015

General Manager
Singleton Council
PO Box 314
SINGLETON 2330

Dear Lindy

Voluntary Planning Agreement Contribution Plan - Warkworth Continuation Project (SSD 6464) & Mt Thorley Continuation Project (SSD 6465)

Following on from the discussion between Singleton Council, Coal & Allied and the Planning Assessment Commission on the 4 September 2015, the purpose of this letter is to capture the agreed position to date and also set out an indicative contribution plan for the Voluntary Planning Agreement (VPA) for the above State Significant Development (SSD) applications.

The VPA contribution plan, as outlined to the Planning Assessment Commission, is summarised as follows:

- Bulga Water and Sewerage Projects
  - Council investigations into reticulation of water and sewerage in Bulga.
  - Contribution of a proportion of the VPA funds to a maximum of $5,000,000.
  - Payment schedule, including initial and final payment triggers, to be agreed.

- Bulga Community Enhancement Projects
  - Council's engagement with the community has identified interest in a range of local community enhancement projects such as:
    - Bulga to Broke cycleway
    - Wollombi Brook recreational access / open space
    - Maintenance upgrades to cemetery, St Marks Church, Bulga Hall
    - Museum / art galley
  - Council is developing costings in conjunction with relevant community members.
  - Contribution of a proportion of the VPA funds to a maximum of $1,500,000.
  - Projects to be identified and approved by a Governance committee, to be developed under the VPA.

- Singleton Economic Development Projects
    - Council have a range of strategies on economic development and diversification such as tourism.
    - Examples include Lake St Clair Upgrade, recreational facilities, destination tourism projects, etc.
    - Contribution of a proportion of the VPA funds to a maximum of $4,500,000.

To provide certainty for both parties on the timing of payments, and to demonstrate our commitment to bring forward expenditure to facilitate community enhancement initiatives in Bulga village, we have developed an indicative VPA payment schedule in **Attachment 1**. Payments would be made subject to an appropriate mining lease(s) being in place and active mining in the areas and at the production rates proposed in SSD 6464 and SSD 6465.

The actual timing and annual contribution may flex within the total contribution, by agreement between the Council and the applicant. This is to enable Council to secure other funding sources (where relevant), carry out consultation with the community and develop detailed costings.

Should you require any further information or clarification, please do not hesitate to contact Elizabeth Yeo on 0467 707 212 or myself using the details below.

Yours sincerely

Mark Rodgers
General Manager – Mount Thorley Warkworth

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Attachment 1 – Indicative VPA Contribution Plan

Rio Tinto

Attachment 1 – Indicative VPA Contribution Plan

VPA Indicative Payment Schedule					
Year	**Nominal Year**	**Bulga major infrastructure fund**	**Other Bulga community project fund**	**Singleton economics development fund**	**Total**
1	2016	$1,000,000	$250,000	$500,000	$1,750,000
2	2017	$1,500,000	$250,000		$1,750,000
3	2018	$1,500,000		$250,000	$1,750,000
4	2019	$1,000,000		$250,000	$1,250,000
5	2020			$250,000	$250,000
6	2021			$250,000	$250,000
7	2022		$250,000		$250,000
8	2023			$250,000	$250,000
9	2024			$250,000	$250,000
10	2025			$250,000	$250,000
11	2026			$250,000	$250,000
12	2027		$250,000		$250,000
13	2028			$250,000	$250,000
14	2029			$250,000	$250,000
15	2030			$250,000	$250,000
16	2031			$250,000	$250,000
17	2032		$250,000		$250,000
18	2033			$250,000	$250,000

VPA Indicative Payment Schedule					
Year	**Nominal Year**	**Bulga major infrastructure fund**	**Other Bulga community project fund**	**Singleton economics development fund**	**Total**
19	2034			$250,000	$250,000
20	2035			$250,000	$250,000
21	2036		$250,000	$250,000	$500,000
	Total	$5,000,000	$1,500,000	$4,500,000	$11,000,000
Notes:					
2016 payment to be made within 3 months of VPA signing.					
Subsequent year payments to be made by December 31 of the previous year.					
Subject to granting of SSD 6464 and 6465 as proposed in the applications for development consent.					
Subject to an appropriate mining lease(s) being in place to allow mining in the areas and production rates proposed in SSD 6464 and SSD 6465.					

Attachment 4
Aboriginal cultural heritage consultation process

Warkworth Continuation 2014 EIS PAC Hearing 7-8 September 2015

Wonnarua Traditional Custodians Comments Responses

Key points raised by Wonnarua Traditional Custodians (WTC) speakers (8 September 2015).

1. The WTC speakers asserted that as native title claimants they have rights under the Native Title Act that have been ignored by Rio Tinto.

The WTC group is involved in two current registered native title claims being WTC and Ors NC2012/005 (Jerrys Plains, Singleton LGA) and the WTC NC2013/003 (Neath, Cessnock LGA). Neither of these native title claims intersect with the Warkworth Mine or any other Rio Tinto owned or managed lands.

2. The WTC speakers assert that as native title claimants they have primacy in the cultural heritage consultation process for the Warkworth Continuation EIS.

The DP&E Secretary's Requirements for the Warkworth Continuation EIS require the proponent to undertake Aboriginal community consultation in accordance with the Office of Environment and Heritage's (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (ACHCRP). Section 4.1 defines people who proponents must undertake consultation with as being 'Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the area of the proposed project'. Persons who wish to be consulted must register their interest to be consulted directly with the proponent and they then assume the status of a Registered Aboriginal Party for the purposes of consultation under the provisions of the ACHCRP.

Under section 4.1 primacy for consultation is afforded only to native title parties where there has been an approved determination that native title exists in relation to the proposed project area. Native title determination has not been made in respect of either of the WTC claims, nor do the claims intersect with the Warkworth Continuation EIS area, therefore the WTC claimants do not have any legal primacy for consultation.

3. Rio Tinto did not consult with the WTC claimants (some speakers indicating that consultation was requested).

Under the provisions of section 4.1 of the OEH ACHCRP, Aboriginal people are required to register their interest in being consulted directly with the proponent. Neither the WTC group nor Mr Kevin Taggart have registered with Coal & Allied for consultation as an Aboriginal Party for the Warkworth Continuation EIS. However, it should be noted that ten of the twelve applicants of the two WTC native title claims are registered as Aboriginal Parties (RAP) for consultation with Coal & Allied and were included in the consultation process for the EIS.

The WTC claimants who are RAPs for consultation with the Coal & Allied Aboriginal Cultural Heritage Working Group (CHWG) are as follows:

- Tom Miller: Lower Hunter Wonnarua Council –registered since 29 September 2005.
- Margaret Matthews: Aboriginal Native Title Consultants - registered since 1 August 2006.

- Des Hickey: Wattaka Wonnarua Cultural Consultants Service – registered since 4 September 2006.
- Allen Paget: Ungooroo Aboriginal Corporation – registered since 11 May 2007.
- Luke Hickey: Hunter Valley Cultural Surveying – registered since 12 August 2007.
- George Sampson: Cacatua General Services – registered since 11 November 2010.
- Warren Taggart: - registered since 25 November 2011.
- Vicki Slater: Kawul Cultural Services (with Rod Hickey) – registered since 14 December 2011.
- Warren Schillings: My Land Cultural Heritage - registered since 2 December 2013.
- Gordon Griffiths: Wonnarua Culture and Heritage - registered since 10 December 2013.

Other members of the WTC group who have not registered for consultation, as is required under 4.1.3(d) of the ACHCRP, have had the opportunity do so at any time since the inception of the Warkworth Continuation EIS. There have been six public notices published in local newspapers, and notices and consultation meeting invitations have been provided to new and existing Registered Aboriginal Parties for consultation on the Warkworth Continuation EIS.

- (Week commencing – w/c) 17 March 2014 public notices published for Warkworth Continuation EIS inception for 3 April 2014 CHWG consultation meeting
- w/c 7 April 2014 public notices for 7 May 2015 CHWG consultation meeting
- 9 April 2014 invitation by letter to RAPs to attend Warkworth Continuation EIS project area inspection tour on 29 April 2014
- w/c 30 June 2014 public notices published for 10 July 2014 CHWG consultation meeting
- w/c 6 October 2014 public notices published for 30 October 2014 CHWG consultation meeting
- w/c 11 May 2015 public notices published for 4 June 2015 CHWG consultation meeting
- w/c 10 August 2015 public notices published for 3 September 2015 CHWG consultation meeting

4. <u>The WTC speakers claim to have knowledge of significant intangible, sacred sites that will be impacted by the expansion. The WTC speakers assert that Rio Tinto are not aware of these sites and have therefore not considered them in the WCP EIS study.</u>

Coal & Allied in consultation with the 83 RAPs (of which ten are WTC native title applicants) involved in the WCP EIS consultation process have adopted a broad definition of what constitutes Aboriginal cultural heritage and the identification of such and significance is determined by the RAPs. Aboriginal cultural heritage considered in the assessment for the Warkworth Continuation EIS includes all places and values of archaeological, traditional, spiritual, historical or contemporary significance. This definition is wide and certainly covers the notion of Aboriginal cultural heritage as described and defined in OEH policy, the National Parks and Wildlife Act 1974 (NPW Act) and also federal legislation. In practical terms, this definition allows, for instance, identification and assessment of places with spiritual or ceremonial values, places which have traditional stories associated with them, places which are historically important (such as old camps) and places which

are of contemporary importance (cultural resource areas or places used for cultural or recreational purposes).

There are two distinct categories of cultural place that demonstrate Aboriginal cultural heritage significance:

- places of cultural significance through their association with creator beings, spirit beings, culture heroes, traditional activities, historical events or contemporary values where there may not be any physical material – sometimes referred to as intangible cultural heritage although very tangible to enculturated Aboriginal people; and
- places where there is material cultural heritage (either organic or inorganic) that derives from cultural activities of Aboriginal people, commonly called archaeological material (such as stone artefacts) and which constitutes the objects protected under the NPW Act.

Examples of the first category of places of high cultural values were identified by the RAPs and recorded within the MTW mining lease area but none were located within the Warkworth Continuation development footprint. The culturally significant places and areas with 'intangible' (and tangible) cultural heritage values that were identified by the RAPs during fieldwork assessments and subsequent consultation process include the Bulga Bora Ground and associated cultural landscape along Wollombi Brook, an arrangement of three stone mounds, and an earthen mound with the potential to contain burial/s. These places and areas with particularly significant cultural values are all located within the 700ha Wollombi Brook Aboriginal Cultural Heritage Conservation Area which is to be protected in perpetuity. During the Aboriginal cultural heritage assessment and consultation processes the Saddleback Ridge area was not identified by any RAPs (including eight WTC native title applicants) as having any particular cultural significance either tangible or intangible.

5. <u>The WTC speakers claim that the EIS cultural heritage study is inadequate because of the absence of this information and the lack of a cultural values study</u>

Coal & Allied in consultation with the 83 RAPs (which includes ten of the twelve WTC native title applicants) have adopted a broad definition of what constitutes Aboriginal cultural heritage, and the identification of such and significance is determined by the RAPs. Aboriginal cultural heritage considered in the assessment for the WCP EIS included all places and values of archaeological, traditional, spiritual, historical or contemporary significance.

The adequacy of the Aboriginal cultural heritage values assessment for the WCP EIS has been assessed by OEH in their submission to the DP&E dated 8 August 2014. In the submission OEH notes that during the consultation process for the WCP EIS, the RAPs expressed their desire to discuss cultural heritage impacts and management at a landscape level. The assessment and consultation process has allowed for the consideration of the long term management of a range of significant Aboriginal cultural heritage places and areas, including the Bulga Bora Ground and its surrounds, and other place identified by the RAPs as having high cultural significance to them at a broader regional context. OEH noted its support for Coal & Allied's approach to addressing cultural values at a landscape level.

Furthermore, in OEH's consideration of the cultural heritage values, impact assessment and management outcomes of the WCP EIS it is stated that OEH 'strongly supports all the management commitments proposed with respect to Aboriginal cultural heritage for the proposed Warkworth Continuation Project 2014' and that it had 'no further comments or requirements for Aboriginal cultural heritage within the extension footprint'.

In the DP&E Secretary's Environmental Assessment Report for the WCP EIS it is stated that both the Department and OEH are satisfied that the Aboriginal heritage assessment and consultation for the project has been undertaken in accordance with applicable guidelines, including the OEH ACHCRP. Overall, the Department was 'satisfied the project's residual impacts are unlikely to have a significant impact on the Aboriginal heritage values of the region'.

The statements made by both OEH and DP&E confirm that the Aboriginal cultural heritage values and impact assessment for the WCP EIS was adequate and appropriate.

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16 September 2015

Clay Preshaw | Team Leader
NSW Planning Assessment Commission
Level 13, 301 George Street Sydney NSW 2000
Via Email: clay.preshaw@planning.nsw.gov.au

And
pac@pac.nsw.gov.au

Dear Clay,

Re: Rio Tinto Warkworth Mine Application

Tocomwall represents the Registered Native Title Claimants for the Plains Clan of the Wonnarua People (PCWP) who currently have three registered native title claims in the Hunter Valley (Federal Court file numbers: NSD1093/2012, NSD788/2013, NSD1680/13).

The following statements represent the PCWP position on the proposed Warkworth Mount Thorley Extension (the Project Area).

We understand that the project site for the proposed Project Area falls entirely within the boundaries of NSD1680/13, i.e. within the PCWP native title claim area.

The PCWP have always made it clear that they do not support the conclusions and recommendations of the Aboriginal Heritage Advisory Committee (AHAC) established by Rio Tinto.

The AHAC is open to anyone that asserts Aboriginality and has no bearing on whether they are Traditional Owners or Native Title Claimants for the area. In fact, other than the PCWP members, no other members have any Traditional connection to the PCWP 'Country' and therefore have no right to speak or make decisions about the area.

As such, AHAC do not have authority or support to make decisions on behalf of the PCWP within their Traditional Lands.

PCWP have traditional connections to the entirety of their country, including the claim areas, based on traditional laws and customs acknowledged and observed by the claim group.

Rio Tinto are obliged under the Office of Environment and Heritage (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010) Section 3 to consult with Aboriginal people because '*Consultation with Aboriginal people is necessary to understand their views and concerns about the proposed project but also to understand the cultural values present in the area*

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that may be harmed (*ibid: Section 3.1: 7).*' They have therefore failed to meet their obligations under these guidelines.

Rio Tinto have never approached the PCWP in order to ascertain the PCWP cultural values of the Project Area. Therefore, they have not addressed their obligations under the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH 2010) under Section 4.3 and therefore fail to meet the requirements of these guidelines.

Rio Tinto have never provided a copy of the completed Aboriginal Cultural Heritage Assessment Report (ACHAR) to the PCWP and therefore have – again – failed to address the requirements under the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH 2010) under Section 4.4.

Rio Tinto has agreed to undertake a cultural offset on land in the Bathurst area in lieu of the destruction of land in the Hunter Valley. PCWP cannot see the logic or relevance – either culturally or scientifically – of offsetting Traditional Wannarua Country for Traditional Wiradjuri Country. To use a 'European' metaphor, it would be comparable to destroying for example a part of Italy and offsetting this with land in the U.K!

If Rio Tinto had consulted as per the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH 2010) they would have been informed by the PCWP of the location of a Bora ground within the footprint of the Project Area. This Bora ground holds very high cultural and scientific value, both to the PCWP as well as the scientific community.

Furthermore, if Rio Tinto had consulted as per the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH 2010) they would have been informed by the PCWP of the location of other highly significant cultural and scientific Aboriginal objects, Places and sites forming part of a significant Wonnarua cultural landscape.

Rio Tinto have made it clear on several occasions that as a registered native title claimant our information and position holds no more weight than any other person who has asserted their Aboriginality and/or is part of their AHAC. This clearly contradicts the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH 2010) under Section 3.3.1 (pp8), namely that:

> '*In some cases, the information required for decision making will be held by Aboriginal people with statutory recognition for certain lands:*
>
> > *…Native title holders or* ***registered native title claimants*** *in accordance with the Native Title Act 1993 (Cth) and NSW Native Title Act 1994.* (my emphasis)'

If the mine is allowed to go ahead it will destroy a place and ground that represent the basic foundation and fabric of PCWP society, namely the Bora ground. The Bora ground is a place that allows our people direct contact with out creator Biami that is a spiritual connection to our beginning and our cultural path from the beginning of time. The importance and beliefs attached to this area could never be understood or demonstrated by Aboriginal people who have no connection to Wonnarua Country and is a violation of our basic human right as the Custodians of this Country.

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The PCWP have many more items of very high cultural and scientific significance in relation to the proposed impacts of the Project Area. However, the culturally restricted nature of this information means that this information can only be discussed under culturally appropriate conditions within a restricted and confidential setting.

Tocomwall and the Registered Native Title Claimants for the Plains Clan of the Wonnarua, do not Support this project being approved as the destruction that it will create will have such a impact of our peoples belief and customs. I would also like to state that we are more then happy to provide more information if required.

Regards,

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NSW Planning Assessment Commission
Commission Secretariat
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Attention: Mr Clay Preshaw
clay.preshaw@planning.nsw.gov.au

08 September 2015

**Submission to the Planning Assessment Commission –
Warkworth Continuation Project and Mt Thorley Continuation Project**

Dear Commissioners,

The following submission raises key issues regarding the Warkworth Continuation Project and the Mt Thorley Continuation Project currently being assessed by the Planning Assessment Commission (PAC), under the new provisions of the draft State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment 2015.

We (Dr Michael Askew and Dr Louise Askew) are qualified social and environmental researchers who have demonstrated experience in undertaking Social Impact Assessments (SIAs), particularly for the resources sector. We were the primary social researchers who undertook the data collection and analysis for the Social Impact Assessments for the proposed Warkworth and Mt Thorley Continuation Projects; however, we were not involved in the development of the final version and submission of the SIAs to the Department of Planning and Environment as part of the Environmental Assessments for the projects.

We fully respect and uphold the confidentiality requirements under which we originally conducted the research for these SIAs. As a result, this submission does not contain any information that is not publicly available in the Environmental Assessment and SIA reports (or elsewhere).

The submission addresses what we believe, in our own personal and professional opinion, to be problematic inaccuracies in the final version of the Social Impact Assessments for the projects. This submission also addresses significant shortcomings in the NSW Department of Planning and Environment Secretary's Environmental Assessment Report (2014) for the projects.

1.0 Social Impacts Assessments

1.1 SIA requirements

- The Department of Planning and Environment Secretary's Requirements (22 May 2014) specified that the Environmental Assessment should include: "an assessment of likely social impacts of the development including perceived impacts paying particular attention to Bulga". We argue that the social impacts have not been rigorously assessed and the perceived social impacts are not explored or illustrated in the detail required as part of typical and adequate SIA practice (see also section 1.6 of this submission). The SIAs are inconsistent with the Secretary's Requirements given that there is:

- No rating or assessment of the social impacts according to a defined assessment matrix (indeed, the SIAs contain no actual assessment of impacts, just reference to potential impacts);
- A refutation and consistent undermining of 'perceived impacts' through the use of 'technical comments'. This directly undermines the perspectives of local stakeholders about felt experience and perceptions of the future and relegates 'perceived impacts' to emotional, psychological states that are devoid of validity. It is widely held amongst the social science, psychology and social impact fields that perceived impacts are felt in a real way by those who hold them, whether verified or not. This, we assume, is why the Secretary required assessment of these impacts. The SIA does not adequately address or assess perceived impacts;
- A consistent focus on regional or State-wide factors without adequate reflection on Bulga, as required by the Secretary. Where impacts are of significant concern for Bulga residents (e.g. noise, property values), the counter argument is made in the SIA that no evidence exists for these impacts in broader geographic settings; and,
- No feedback from stakeholder engagement in any detail in the assessment and there is no analysis of these issues nor rating of the social impacts. Stakeholders were not engaged to provide feedback on the identified issues nor on the proposed mitigation measures, other than through responses to the public exhibition of the assessment reports.

- The Secretary's Requirements were provided on 22 May 2014; however, the SIAs were finalised on 13 June 2014. We suggest that this short time between receipt of requirements and finalisation of the SIA precludes the rigorous assessment of social impacts requested by the Secretary, Department of Planning and Environment.

1.2 Use of legal precedents

- We suggest that the use of legal precedents in the SIA is inappropriate: e.g. "New Century Developments Pty Ltd vs Baulkham Hills Shire Council 2003 L&E Court 154"; "Telstra Corporation vs Hornsby Shire Council 2006 L&E Court 133"; "BMPA vs Minister for Planning & Infrastructure and Warkworth Mining Ltd". We believe these judgments are unrelated to the projects under assessment, reflecting concerns regarding religious discrimination and irrational / unjustified fear. We argue that the residents surrounding the current Mount Thorley Warkworth (MTW) operations have, in many cases, long-running and informed knowledge of the impacts of current operations and their likely impacts under the proposed continuation. Therefore, their perceptions are not irrational and unjustified but are instead based on well-informed judgments and first-hand experience.
- The use of the "BMPA vs Minister for Planning & Infrastructure and Warkworth Mining Ltd" is also inappropriate considering this related to a previous EIS for these projects which approval for was overturned in the NSW Land & Environment Court. Also, this decision states that SIA should consider "both the objective data and broader experiential evidence from residents of impacts at a local level" – experiential evidence has not been examined or assessed as part of this SIA, but merely presented and then countered.

1.3 Employee and supplier survey

- The survey questionnaire should be included as an appendix, as this is typical and expected social research and SIA practice. There also needs to be more detail provided on the set up and sampling undertaken for the survey. It is currently impossible to understand what questions were included in the survey, the sampling method employed to recruit respondents, and whether employees were asked about the proposed project or just about current operations.
- In the description of current operations, the document states that 17.8% of the current workforce resides in Maitland; however, in the MTW Employee and Supplier Survey it states that 30.8% of the workforce reside in Maitland – how can this vary so much considering the size of the survey sample and the fact that all the other workforce proportions match almost precisely?
- The data demonstrates the short-term residency of the workforce, with over half of the workforce residing in the area less than 5 years.
- Over 60% of suppliers stated that less than 10% of the revenue they receive is from MTW, and 30% stated it was less than 30% of revenue – this indicates minimal supplier reliance on MTW. MTW supplier spend has declined significantly in recent years (see Rio Tinto Sustainable Development Report 2014).

1.4 Current operations

- There are an extremely high number of complaints for the existing operations, particularly regarding noise, which was supported by the previous NSW Land and Environment Court decision regarding the previous assessment of these projects. This significant existing impact needs further recognition and analysis using experiential stakeholder evidence.
- The Rio Tinto community investment figures do not provide any context to understand the extent of the benefit - i.e. what have investment figures been over time and how is it distributed between operations? The latest Rio Tinto Sustainable Development Report (2014) provides some of this context and should be included as part of the SIA.

1.5 Baseline

- An increase of 37 and 96 persons respectively in Bulga and Broke cannot justifiably be considered as “significant growth”, particularly when other small surrounding villages are declining and Singleton suburb itself is declining. Camberwell and Warkworth have declined substantially between 2006 and 2011, with a population decline of -52% and -67% (a decrease of 198 and 370 persons respectively).
- Bulga demonstrates long term residency and this needs to be recognised as an important indicator of community cohesion and sustainability – i.e. 51% of Bulga residents with the same residential address 5 years ago, giving Bulga the lowest level of in-migration of all areas.
- The appendices reveal further detail on health and perceptions not provided in the main report:
  - “More than 80% of respondents were aware of some negative changes in their area. When compared with the identification of positive changes, this implies that perceptions of negative impacts outweighed perceptions of positive impacts within

the community. Mining expansion was the most frequently cited negative change in the mining impacted areas." *See Appendix B*

- "It was recommended that respiratory problem management over time be further explored, as comparisons between the 1998-2004 and 2005-2010 datasets for management of rates of respiratory problems demonstrated no significant change in the Hunter Region despite a significant decrease for the remainder of rural NSW over this period (Merritt et al. 2013)." *See Appendix B*

1.6 Impact assessment

- The entire impact analysis section lacks evidence of social research and is devoid of actual, structured assessment of impacts, a requirement not only of the Secretary (NSW Department of Planning and Environment) but also typical of common SIA practice for major projects. There is neither in-depth thematic quantitative analysis of identified social impacts (except for one graph on pg. 71) nor qualitative analysis (with a lack of stakeholder quotations to illustrate research findings). In addition, it is impossible to decipher the meaning of some of the impact/opportunity themes listed in the graph on pg. 71: e.g. 'property saleability' – is this a positive or negative impact?; property market stabilisation – where is this happening and is this a positive or negative impact?
- There is no sense of an overall assessment of impacts and opportunities – how many stakeholders identified positive versus negative impacts? Where do these stakeholders reside? What are their experiential accounts of these impacts and opportunities?
- There are no ratings of impacts and opportunities – this is considered very typical of any impact assessment. There are many available and widely used standard rating scales used in SIA practice (see QLD Government SIA Guidelines 2013). At no point is an assessment matrix provided to assess the relative extent of each impact or opportunity. In addition, stakeholders were not provided with the opportunity to comment and provide feedback on impact/opportunity ratings.
- The predominant use of the reference case is atypical in SIA practice – it appears this assessment is primarily based on the reference case of 'no development'. Although this 'no development' case should be considered as part of any SIA, in this report it outweighs consideration of the impacts if the project does proceed.
- The consideration of specific impacts lacks social research, analysis or impact assessment – i.e. there is no quantitative or qualitative data or analysis provided, there are no stakeholder quotations, and there is no supporting literature or research. See below:
  - **Noise:** considering the obvious significance of noise impacts (based on the complaints profile, the previous EIS and the experiential evidence from residents), very little detail is provided based on social research, relevant literature or the experiences of local stakeholders.
  - **Community and family cohesion:** it states that population decline is considered unlikely despite the fact that the rest of Singleton and other similar small mining communities in the area are experiencing decline; voluntary acquisitions (24 out of 150 houses in Bulga) are not considered in the analysis of impacts, which is fundamentally misleading in an assessment of social impacts; and the report assumes that an 'acceptable level of amenity' will be retained. These issues together are incongruous.
  - **Visual amenity:** the 2002/03 EIS for Warkworth frequently notes the importance of Saddleback Ridge in protecting Bulga from the direct impacts of the mine; however, this previous assertion is not acknowledged in this assessment.

- **Loss of sense of place:** it is assumed that this loss will impact MTW employees as much as Bulga residents; however, the mining workforce demonstrates high rates of fluctuation and short-term residency (as noted in Section 3 of the SIA), whereas Bulga demonstrates long-term residency and connections with the area.
- **Education:** claims of school closures are misleading considering the assumption of 107 school children likely to leave the area if the project does not proceed – this represents just 0.4% of the total number of school children in the region (based on My School data 2011). It is highly unlikely that this level of fluctuation would result in school closures.
- **Health and well-being:** a health impact assessment should be conducted for the impacts on health and well-being to be properly assessed; as noted above, Merritt et al. (2013) also states that: "It was recommended that respiratory problem management over time be further explored, as management rates of respiratory problems demonstrated no significant change in the Hunter Region despite a significant decrease for the remainder of rural NSW over this period" Appendix B; there are a raft of other health studies not referenced here that would indicate concern and the need for further research on health impacts of mining – eg Commonwealth Senate Inquiry into the Impacts on Health of Air Quality in Australia (2013), World Health Organization assessments of noise pollution and health.
- **Property values:** the Stubbs analysis used here has already been discredited in the NSW Land & Environment Court. In particular, the sample size used is misleading and does not compare 'like-for-like' properties e.g. a sale of a shed is compared with a sale of a 400ha property. Moreover, the most recent Valuer General's Report indicates an average decrease in property prices around Bulga/Broke of -11.65% (Newcastle Herald report 27 June 2014).

1.7 Workforce

- The report consistently references the maintenance of 1,300 people in the MTW workforce who will continue in their employment if the projects are approved. This number does not present an accurate reflection of the workforce over time. Indeed, it is our understanding from public reports that this number is the 'peak workforce'. The assessment needs to provide a detailed workforce planning profile over the life of the mine and its proposed continuation in order to fully comprehend potential impacts and opportunities and plan for workforce change. Any errors in workforce number assumptions lead to exponential errors in the Input/ Output Economic Models.
- Section 5.2 reiterates the Economic Impact Assessment and does not provide any additional social research or analysis. Indeed, we forward strong reservations about the uncritical use of data from the Economic Impact Assessment. This is further discussed in Section 2.0 of this submission.
- The report states that 195 workers will leave the region (including Newcastle, Lake Macquarie and the Upper Hunter region) if the project does not proceed – this represents approximately 0.09% population change for the entire region, which should be recognised as insignificant. Indeed, Burdge (2004) states that permanent population change of less than 5% is rated as insignificant in impact (Burdge, J. 2004. A community guide to SIA. Wisconsin, Social Ecology Press). The report does not provide an assessment of the significance of any population or workforce changes.
- The impacts on the property market considers only the impacts on the Singleton housing market, and does not address impacts on Bulga and other smaller communities surrounding the operations. This is in direct contradiction of the Secretary's Requirements to assess impacts on Bulga particularly.

- Workforce volunteering rates: the ABS undertakes a dedicated survey of volunteering nationally which provides a more accurate reflection of volunteering rates than the census – the most recent survey states that, on average, 41% of people outside of capital cities and 34% residing in capital cities undertake volunteering work – this is above the 33% of the MTW workforce who undertake volunteering (ABS 4441.0 - Voluntary Work, Australia, 2010).

1.8 Management and mitigation

- The proposed management strategies amount to a total of 2 pages of the SIA report. Moreover, it is understood from public reports that most of the proposed strategies already exist and are in operation at MTW. Considering the vast scale of the proposals (705 hectares of open cut coal mine, within 2.6km of Bulga) and the existing impacts experienced by this community, the extent of management strategies proposed seems grossly inadequate.
- The only additional social impact management commitments (i.e. in addition to those already in place at MTW) are: the Social Impact Management Plan (which is not required in NSW but is a typical part of SIA practice); the Voluntary Planning Agreement (which is required under planning legislation); and the proposed Near Neighbour Amenity Resource.
- Considering the extremely high rates of current complaints regarding this operation and the lack of stakeholder trust in the operation, an 'ongoing' and 'business as usual' approach to impact management will be ineffective.

2.0 NSW Department of Planning and Environment – Secretary's Environmental Assessment Report

We also wish to address concerns with the assessment of Socio-Economic impacts and Land Use in the NSW Department of Planning and Environment Secretary's Environment Assessment Report 2014 for the Warkworth and Mt Thorley Continuation Projects. In our view there are significant shortcomings in the report.

Given our experience in social research and SIA, we principally focus on issues in Section 5.9 (Socio-Economics and Land Use), as noted below:

- The report states that the 'EIS includes an assessment of the social impacts and benefits of the project' (pg. 81). At no point in the SIAs is any attempt made to actually assess the impacts and opportunities of the proposals. As mentioned previously in this submission, the SIAs do not utilise impact assessment matrices which guide the assessment of the relative severity or strength of impacts/ opportunities. The Report fails to acknowledge that this lack of impact/ opportunity assessment directly contravenes the requirements the Department itself set out through the Secretary's Requirements.
- It is asserted that the 'Department has noted that many of the matters raised by the BMPA were the same as those raised in response to the Warkworth Extension Project, despite the project having been substantially modified in response to stakeholder concerns' (pg. 81). The Department is provided with no evidence to make this assertion nor justify it. The current proposals before the PAC are substantively the same as the Warkworth Extension Project and there is no evidence on the public record that substantial modifications were made in response to stakeholder concerns.
- The analysis of the potential impacts of the projects on property values is vague and unsupported (pg. 82), despite representing a critical issue for the social and economic well-being of communities. The report inconclusively states that property prices might go up or they might go down in Bulga without any supporting research or evidence.

- It is noted that the '… the majority of submissions were supportive of the project' (pg. 82). We were unaware of any provision in regulation that affords significance to the number of submissions either for or against a proposal.
- It is continually asserted that the projects will 'maintain 1,300 jobs over the longer term' (pg. 82). This is despite the EIS clearly stating that this number of employees represents the 'peak workforce' and that numbers of employees would vary over the project life. It is prudent for a rigorous assessment to recognise and plan for the variability of the prospective workforce and associated socio-economic impacts over time.
- The report lists a number of socio-economic initiatives that would be discontinued if the projects were not approved (pg. 83) and asserts that the projects will include 'a social impact management plan to guide the implementation of community initiatives identified in the EIS social impact assessment' (pg. 83). It is not made clear whether these initiatives are an existing part of current operations or to what extent, if any, they actually provide substantive benefits to the community.
- The Department states that it 'is satisfied that the project would enable the significant benefits of the project to be realised, which would outweigh the residual costs of the project for the local community as a whole' (pg.83). This language purports 'significant benefits' whilst diminishing the community impacts as merely 'residual'. There is little to no evidence used to support this assessment.

- We also note a number of issues within the Department's review of the Economic Impact Assessment (Section 2.3). These issues may result in the significant overestimation of economic benefits through the Input/ Ouput multipliers (as has been indicated by the NSW Land and Environment Court and previous PAC hearings) which, in turn, has direct and substantive implications for the assessment of social impacts and benefits, as outlined below:
  - It is implied that the terms of reference for the review of the Economic Impact Assessment undertaken by Deloitte Access Economics include assessing 'coverage of the economic costs and benefits' (pg. 18); however, there is no indication that the review included assessment of the items within the Economic Impact Assessment. This is a critical distinction in that the review greatly relies on the original assumptions and assessments undertaken by BAEconomics. This has significant repercussions for the quality of the assessment forwarded by the Department.
  - The apparent overestimation of Average Annual Wages and Salaries (approximately $170,000), which includes all possible or potential benefits that may accrue to an employee over the life of the project (e.g. redundancy, sick leave, etc.), does not adequately reflect actual yearly disposable income upon which Input/ Output Models are primarily based.
  - The labour market assumptions do not provide for employees to be re-employed on similar wages either in the mining industry generally or within the proponent's other operations. The assumption is made that redundant employees will largely return to working for the average annual wage in the region.
  - The assessment does not include typically requisite workforce modelling to adequately assess the variability of the workforce and associated socio-economic impacts over the life of the project.

3.0 Concluding Comments

What is evident from the published reports, assessments and NSW Land and Environment Court findings, along with our own personal knowledge of the affected areas, is that the social impacts from the proposed projects would significantly outweigh the socio-economic opportunities if the projects were to proceed. Surrounding communities, like Bulga, are especially vulnerable to disruption, degradation and displacement from proximate extractive projects; at the same time, they hold the key to successful transition to the economies of the future (through agriculture, entrepreneurism, new and decentralised energy generation technologies, etc). The proposed projects represent a direct and real threat to the future of Bulga and surrounding communities and the ongoing health and sustainability of the region.

We trust that you, the Commissioners, will make the right and just decision regarding these projects.

Kind Regards,

Dr Michael Askew and Dr Louise Askew

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10 September 2015

Ms Lynelle Briggs
Chairperson
Planning Assessment Commission
Level 13
301 George Street
SYDNEY NSW 2000

Re: R034/15 and R035/15 - response to matters raised at hearings

Dear Ms Briggs

EMGA Mitchell McLennan Pty Limited (EMM) has been made aware of a submission presented to the NSW Planning Assessment Commission (PAC) in response to the request for a review of the Warkworth Continuation Project (SSD 6464) and Mt Thorley Continuation Project (SSD 6465) by the NSW Minister for Planning. We understand that this submission was prepared by Michael and Louise Askew who were members of the social impact assessment (SIA) project team. Whilst EMM has not seen the content of the submission, this letter presents the following relevant matters regarding the SIA's method and findings to the PAC.

- The SIA is an EMM document and EMM stands by its findings and maintains that it accurately reflects the community consultation undertaken. The SIA has been produced by a highly experienced team who completed the work with professional skill and diligence.

- The method for the preparation of the SIA was consistent with leading practice and the approach taken by the NSW Land and Environment Court (LEC) which requires consideration of the objective data ('concrete likely effects of the proposed development') and the experiential evidence ('subjective fear or concern') from residents.

- Michael and Louise Askew's principal contribution to the SIA was background research, initial consultation and reporting of these consultation activities. These tasks were undertaken in the early phases of the SIA process and their involvement in the project ceased during preparation of the technical studies, well in advance of finalisation, and incorporation of results into the SIA.

No guidelines or policies have been provided by the State since the LEC judgment on Warkworth Mine. The method for the preparation of the SIA followed leading practice, including that in the Community Development Toolkit (2012) prepared by the World Bank specifically for addressing social issues associated with the mining sector.

The SIA involved gathering comments from a wide range of stakeholders and these have been fairly and objectively reported in it. The SIA was undertaken in accordance with the Secretary's Environmental Assessment Requirements but also addressed the issues identified in the LEC judgment. The SIA has been deemed adequate by both the NSW Department of Planning and Environment (DP&E) and the PAC.

As noted above, the Chief Judge's approach to SIA (par. 430 of the LEC judgment) requires consideration of the objective data ('concrete likely effects of the proposed development') and the experiential evidence ('subjective fear or concern') from residents. The objective data shows that despite the experiential

evidence of residents of Bulga, the amenity criteria for the village of Bulga are satisfied in accordance with the mandatory requirements listed in clause 12AB of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP).

The SIA used objective data and findings of technical studies - such as noise and air quality assessments - plus Australian Bureau of Statistics (ABS) census data showing that Bulga has:

- a population that is growing compared to those in Singleton, Muswellbrook and Upper Hunter local government areas (LGAs);
- a low unemployment rate comparative to that of NSW;
- higher median income comparative to that of Singleton, Muswellbrook and Upper Hunter LGAs and NSW; and
- no noticeable effect on property prices during the preparation, lodgement and assessment of the Warkworth Extension Project 2010 over a four year period from 2008 to 2012.

These factors show that established and new residents of Bulga find it an attractive residential location offering good amenity and situated to take advantage of job opportunities in the locality. Further, the EIS shows that these conditions will not change materially as a result of the projects.

Social impact issues identified by the residents of Bulga were impacts on the physical environment, health and well-being, economy, infrastructure and services, community engagement, relationships and governance. Consistent with leading practice, the SIA considered social impacts if the projects did not proceed. Issues identified included workers and families would need to move away from area, unemployment and financial difficulties, reduced local spending, decreased local business, population decline, reduced viability of services such as schools, and reduced community life and participation. These stakeholder perceived social impacts were considered together with the outcomes of the technical studies such as noise and air quality in the assessment of the projects.

Noise and air quality goals/criteria established under government policies provide benchmarks set to protect the community against adverse effects, and generally reflect current Australian community standards for the protection of health and against nuisance effects. Criteria are applied for all of NSW, irrespective of industry and location. Therefore, compliance with these would suggest that general health and amenity are being protected.

Maintaining compliance throughout the life of the projects is reflected in commitments made under the proposal and will continue to be evidenced by the outcomes of monitoring and auditing against noise and air quality criteria with the results publically available on Rio Tinto Coal Australia's website.

All of the Mining SEPP's non-discretionary standards are met for the village of Bulga and all surrounding privately-owned properties, with the exception where the cumulative annual average criteria is exceeded for two properties northwest of Warkworth Mine which are already afforded acquisition rights by neighbouring mines.

It is important to recognise that the projects have incorporated design and operational improvements compared to the previous Warkworth Extension Project. These were developed with consideration to, amongst other matters, feedback received during stakeholder engagement for the projects and the LEC judgment. These improvements were designed to avoid, mitigate and manage the identified impacts to achieve an appropriate balance between environmental, social and economic impacts and maintaining the viability of the mine.

As noted in the response to submissions reports for both the Warkworth Continuation Project (Section 7.2.7(ii)(a) page 315) and Mt Thorley Continuation Project (Section 7.2.4(ii)(a) page 190), Michael Askew

and Louise Askew were members of the SIA study team who principally undertook the one-on-one consultation. This consultation was undertaken in the early phases of the SIA process and, as noted above, their involvement in the project ceased during the preparation of the technical studies, well in advance of their finalisation, and incorporation of results into the SIA. While their views are acknowledged, they do not reflect the objective reference points given outlined above and presented in the SIA.

In summary, the comprehensive SIA prepared by EMM demonstrates that, on balance, the social effects of the proposals would be positive. EMM stands by the SIA and its conclusions entirely.

Yours sincerely

Paul Mitchell OAM FPIA
Director
pmitchell@emgamm.com

Warkworth Sands Woodland: Some Key Points

Dr Stephen Bell *Eastcoast Flora Survey* & *University of Newcastle* (School of Environmental & Life Sciences)

1. How important is the Warkworth Sands Woodland community?
2. Can we really restore Warkworth Sands Woodland on mining and former grazing lands?

NOMINATION

(565)

NSW SCIENTIFIC COMMITTEE

Nomination for listing an endangered ecological community

Name of Community (use the generally accepted name, if any):

WARKWORTH SANDS WOODLAND

Description of the major components of the ecological community:

WOODLAND OCCURRING ON AEOLIAN SANDS OF PLEISTOCENE AGE. DOMINANT SPECIES INCLUDE: Angophora floribunda, Banksia integrifolia, Acacia filicifolia, Pteridium esculentum, Imperata cylindrica var. cylindrica, Brachyloma daphnoides subsp. daphnoides, Melaleuca thymifolia

Locality of community: Sydney Basin Bioregion, about 6 km ESE of Singleton in the mid-Hunter Valley.

Threatened Species Conservation Act - Criteria for listing

An ecological community is eligible to be listed as an endangered ecological community if, the opinion of the Scientific Committee:

a) it is likely to become extinct in nature in New South Wales unless the circumstances a factors threatening its survival or evolutionary development cease to operate, or
b) it might already be extinct.

Definitions:

animal *- any animal-life that is indigenous to New South Wales or is known to periodica or occasionally migrate to New South Wales, whether vertebrate or invertebrate and in a stage of biological development, but does not include humans or fish within the meaning the Fisheries Management Act 1994.*

ecological community *– an assemblage of species occupying a particular area.*

plant *- any plant-life that is indigenous to New South Wales, whether vascular or no vascular and in any stage of biological development, and includes fungi and lichens, but do not include marine vegetation within the meaning of the Fisheries Management Act 1994.*

species *of animal or plant includes any defined sub-species and taxon below a sub-spec and any recognisable variant of a sub-species or taxon.*

11/02/02

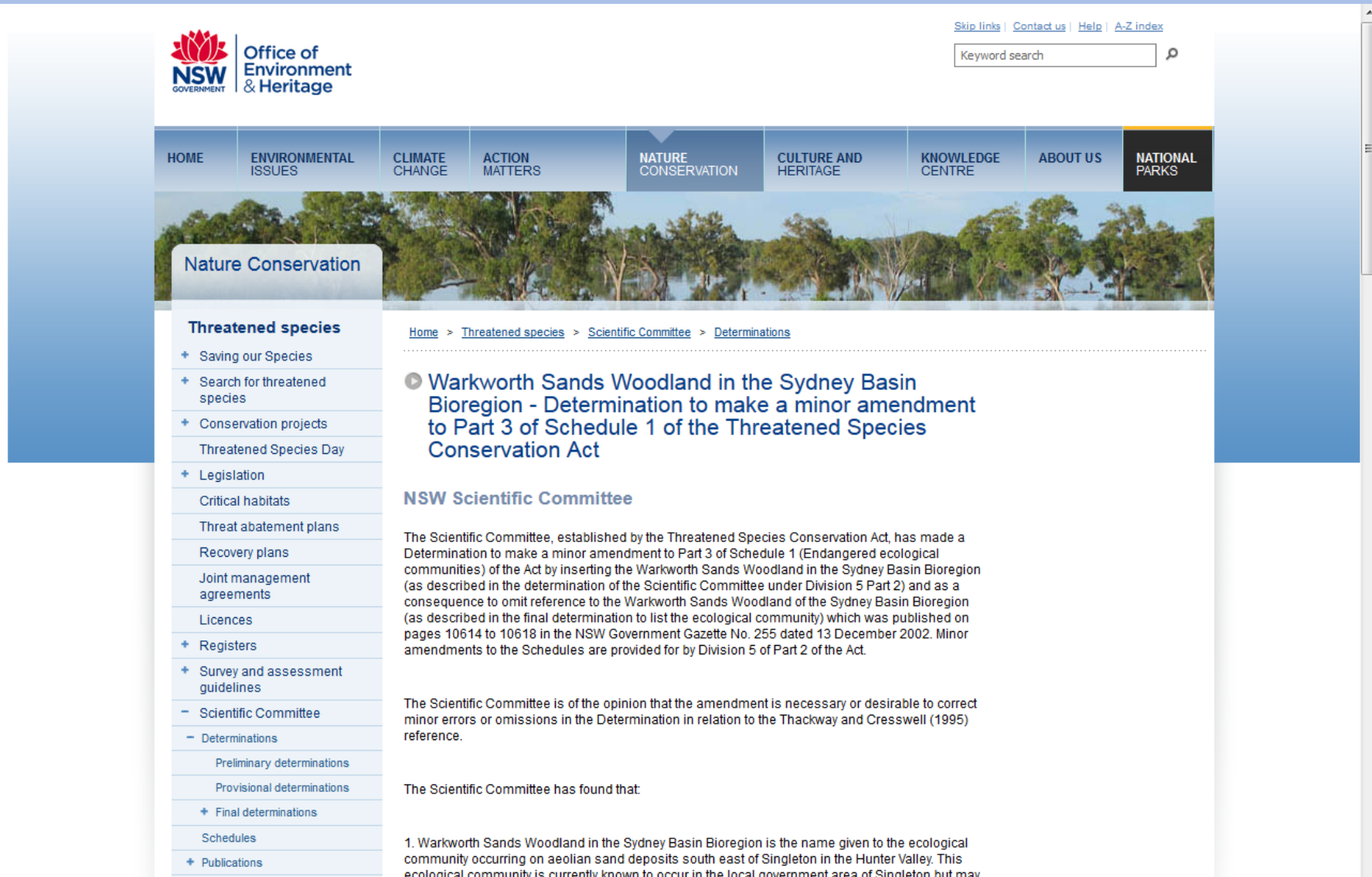
Continue

Acknowledged by email. 3/6/02

Description:
In defining Warkworth Sands Woodland the following common species have been listed after survey and reconnaissance of the community:

Characteristic species	Occasional species
Acacia filicifolia	*Acacia falcata*
Allocasuarina littoralis	*Ajuga australis*
Amyema pendulum subsp. *pendulum*	*Allocasuarina luehmannii*
Angophora floribunda	*Aristida ramosa* var. *speciosa*
Aristida calycina var. *calycina*	*Aristida warburgii*
Aristida vagans	*Calotis cuneifolia*
Banksia integrifolia subsp. *integrifolia*	*Cheilanthes sieberi* subsp. *sieberi*
Brachyloma daphnoides subsp. *daphnoides*	*Chrysocephalum apiculatum*
Breynia oblongifolia	*Desmodium varians*
Callitris endlicheri	*Dichondra* species A
Dianella revolute var. *revoluta*	*Echinopogon caespitosus* var. *caespitosus*
Entolasia stricta	*Echinopogon intermedius*
Eucalyptus blakelyi/tereticornis	*Einadia trigonos*
Exocarpos cupressiformis	*Eucalyptus crebra*
Exocarpos strictus	*Eucalyptus glaucina*
Hardenbergia violacea	*Hovea linearis*
Hibbertia linearis	*Hypoxis hygrometrica* var. *hygrometrica*
Imperata cylindrica var. *major*	*Indigofera australis*
Jacksonia scoparia	*Melaleuca decora*
Leucopogon muticus	*Solanum prinophyllum*
Lomandra glauca	*Vittadinia sulcata*
Lomandra leucocephala subsp. *leucocephala*	
Melaleuca thymifolia	
Persoonia linearis	
Pimelea linifolia subsp. *linifolia*	
Pomax umbellata	
Pteridium esculentum	

STATE LISTING: NSW TSC ACT



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Warkworth Sands Woodland in the Sydney Basin Bioregion - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act

NSW Scientific Committee

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Determination to make a minor amendment to Part 3 of Schedule 1 (Endangered ecological communities) of the Act by inserting the Warkworth Sands Woodland in the Sydney Basin Bioregion (as described in the determination of the Scientific Committee under Division 5 Part 2) and as a consequence to omit reference to the Warkworth Sands Woodland of the Sydney Basin Bioregion (as described in the final determination to list the ecological community) which was published on pages 10614 to 10618 in the NSW Government Gazette No. 255 dated 13 December 2002. Minor amendments to the Schedules are provided for by Division 5 of Part 2 of the Act.

The Scientific Committee is of the opinion that the amendment is necessary or desirable to correct minor errors or omissions in the Determination in relation to the Thackway and Cresswell (1995) reference.

The Scientific Committee has found that:

1. Warkworth Sands Woodland in the Sydney Basin Bioregion is the name given to the ecological community occurring on aeolian sand deposits south east of Singleton in the Hunter Valley. This ecological community is currently known to occur in the local government area of Singleton but may


WSW - Proposed Disturbance area


‘WSW’ - Proposed Offset area

STATE LISTING: TSC REGULATION 2010

NSW Scientific Committee
Listing guidelines version 1.3, January 2012

Table 9. Corresponding thresholds of geographic distribution size for the TSC Regulation 2010 and the IUCN (2001) Red List criteria. The recommended spatial scale for assessment is 2 km grid cells.

Category of threat	Requirement under Clause 18 of TSC Regulation 2010	Thresholds for Extent of Occurrence under criterion B1 of IUCN (2001)	Thresholds for Area of Occupancy under criterion B2 of IUCN (2001)
Critically Endangered	very highly restricted	≤100 km^2	≤10 km^2
Endangered	highly restricted	≤5000 km^2	≤500 km^2
Vulnerable	moderately restricted	≤20000 km^2	≤2000 km^2

Warkworth Sands Woodland	40 km^2	4.3 km^2

NATIONAL LISTING (EPBC ACT)

Criterion 2: Distribution.

- very restricted (area of occupancy <1000 ha; extent of occurrence <100 km^2) and;
- currently under threat

→ WSW = <u>Critically Endangered</u>
[426 ha occupancy area &
40 km^2 extent of occurrence]

Australian Government
Department of the Environment

Guidelines for Nominating and Assessing the Eligibility for Listing of Ecological Communities as Threatened according to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *EPBC Regulations 2000* (EPBC Regulations)

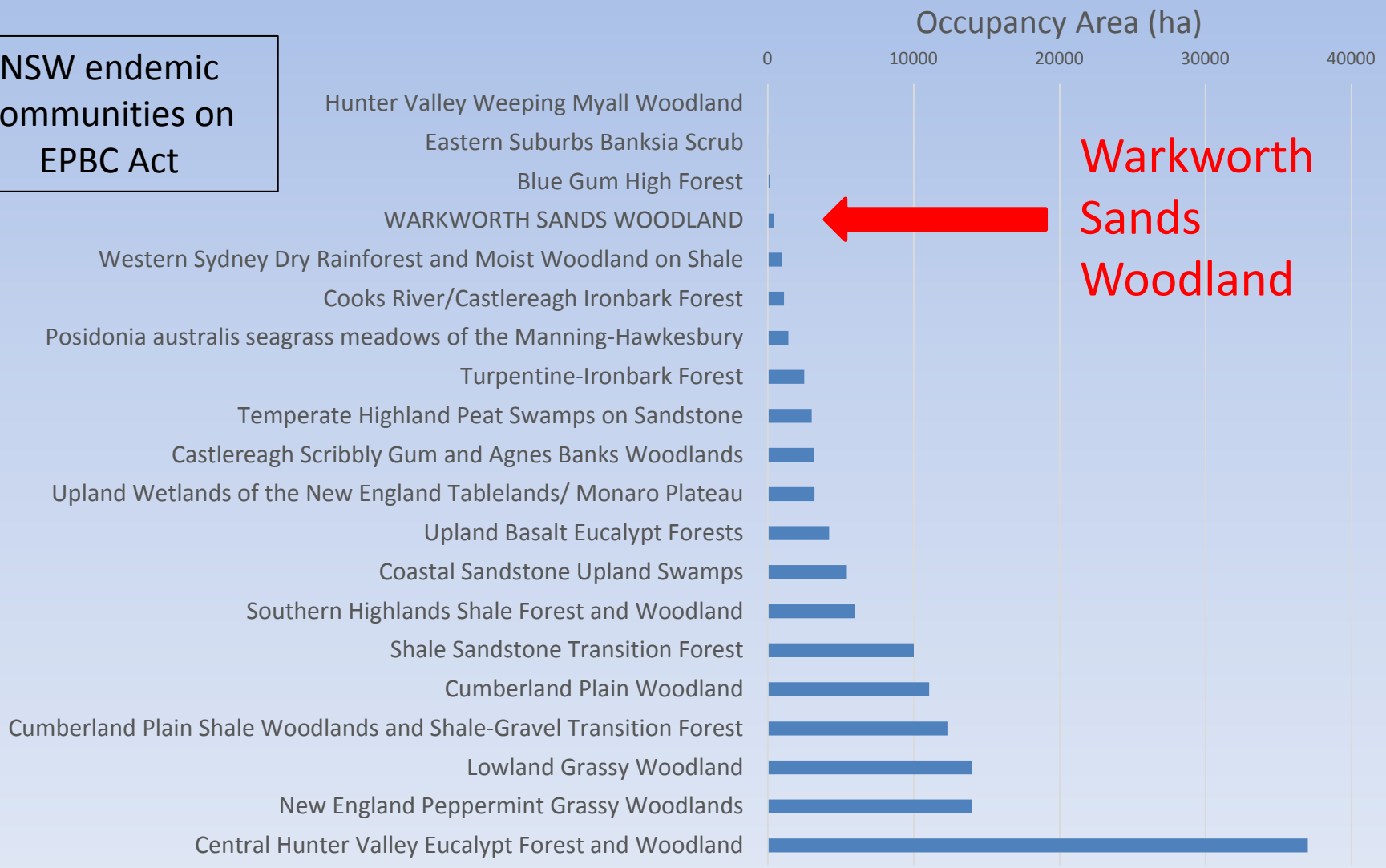
Threatened Species Scientific Committee (TSSC)

Part A	Introduction and purpose of the Guidelines
Part B	Advice for completing the nomination form: General concepts and definitions applied by the TSSC
Part C	Advice for completing the nomination form: Addressing the criteria for listing ecological communities under the EPBC Act and EPBC Regulations
Appendix 1	Area of occupancy and extent of occurrence
Appendix 2	Guidance for addressing climate change as an important threat

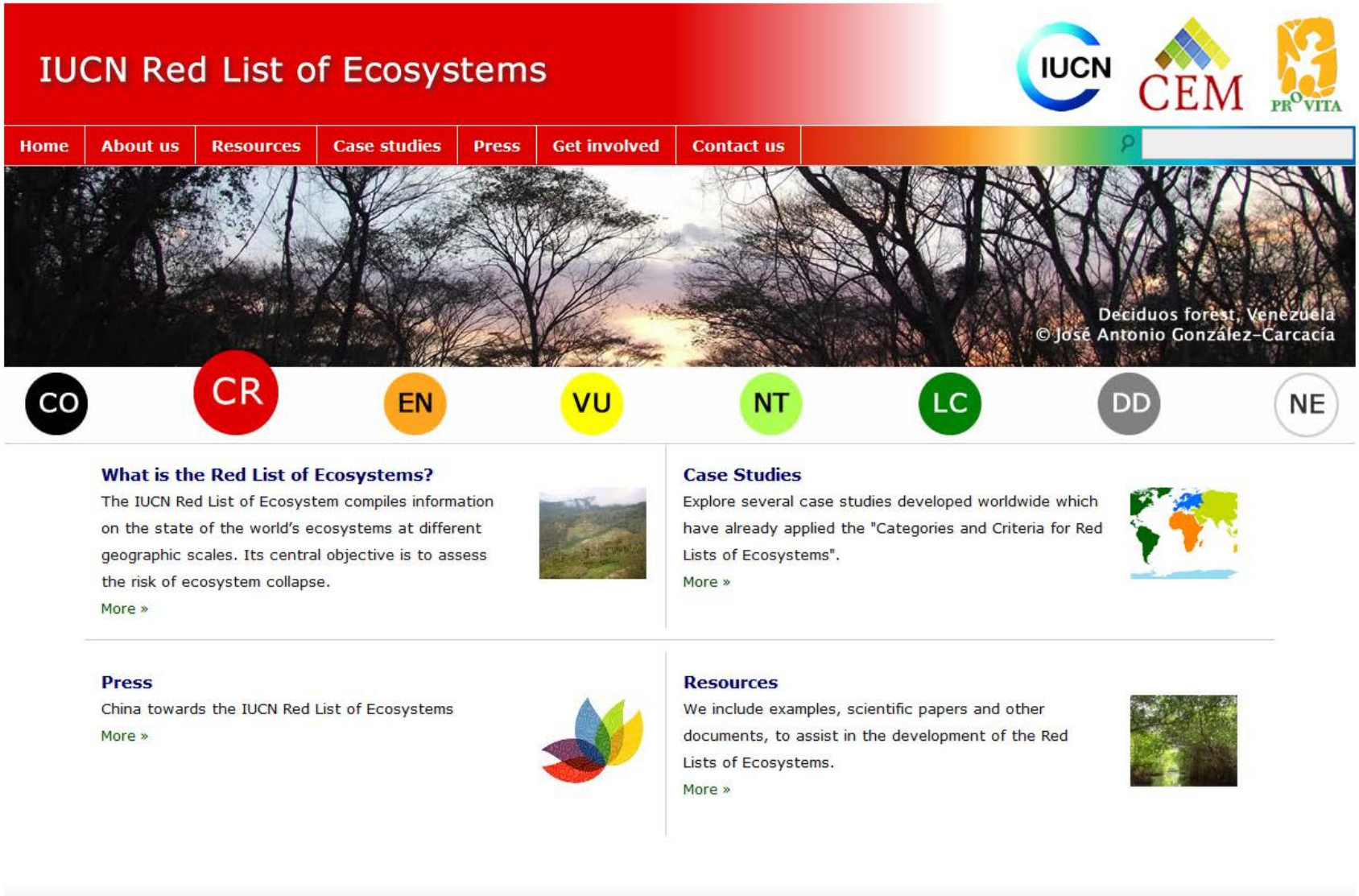
Updated as of June 2013

CRITERION 2: OCCUPANCY AREA

NSW endemic communities on EPBC Act



IUCN RED LIST CRITERIA



INTERNATIONAL LISTING CRITERIA

B. Restricted distribution - particularly applicable to Warkworth Sands Woodland

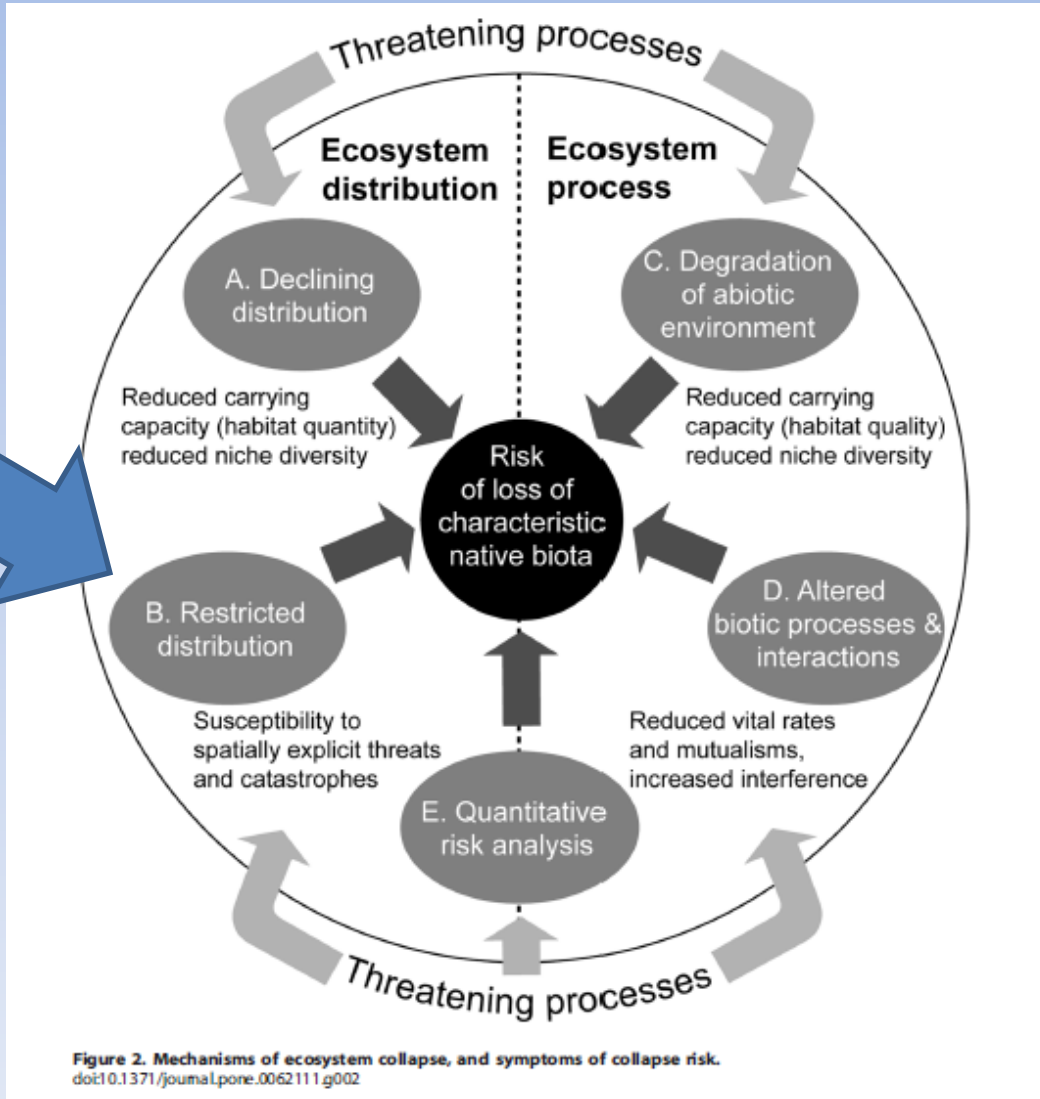


Figure 2. Mechanisms of ecosystem collapse, and symptoms of collapse risk.
doi:10.1371/journal.pone.0062111.g002

Citation: Keith DA, Rodrı´guez JP, Rodrı´guez-Clark KM, Nicholson E, Aapala K, et al. (2013) Scientific Foundations for an IUCN Red List of Ecosystems. *PLoS ONE* 8(5): e62111. doi:10.1371/journal.pone.0062111

IUCN RED LIST CRITERIA

Table 3. IUCN Red List criteria for ecosystems, version 2.0.

			Critically Endangered	Endangered	Vulnerable
A	Reduction in geographic distribution over ANY of following periods:				
	1	Present (over the past 50 years)	≥80%	≥50%	≥30%
	2a	Future (over the next 50 years)	≥80%	≥50%	≥30%
	2b	Future (over any 50 year period including the present and future)	≥80%	≥50%	≥30%
	3	Historic (since 1750)	≥90%	≥70%	≥50%
B	Restricted geographic distribution indicated by EITHER:				
	1	Extent of a minimum convex polygon enclosing all occurrences (Extent of Occurrence), OR	≤2,000 km^2	≤20,000 km^2	≤50,000 km^2
	2	The number of 10×10 km grid cells occupied (Area of Occupancy)	≤2	≤20	≤50
		AND at least one of the following (a-c):			
		(a) An observed or inferred continuing decline in EITHER:			
		i. a measure of spatial extent appropriate to the ecosystem; OR			
		ii. a measure of environmental quality appropriate to characteristic biota of the ecosystem; OR			
		iii. a measure of disruption to biotic interactions appropriate to the characteristic biota of the ecosystem			
		(b) Observed or inferred threatening processes that are likely to cause continuing declines in either geographic distribution, environmental quality or biotic interactions within the next 20 years			

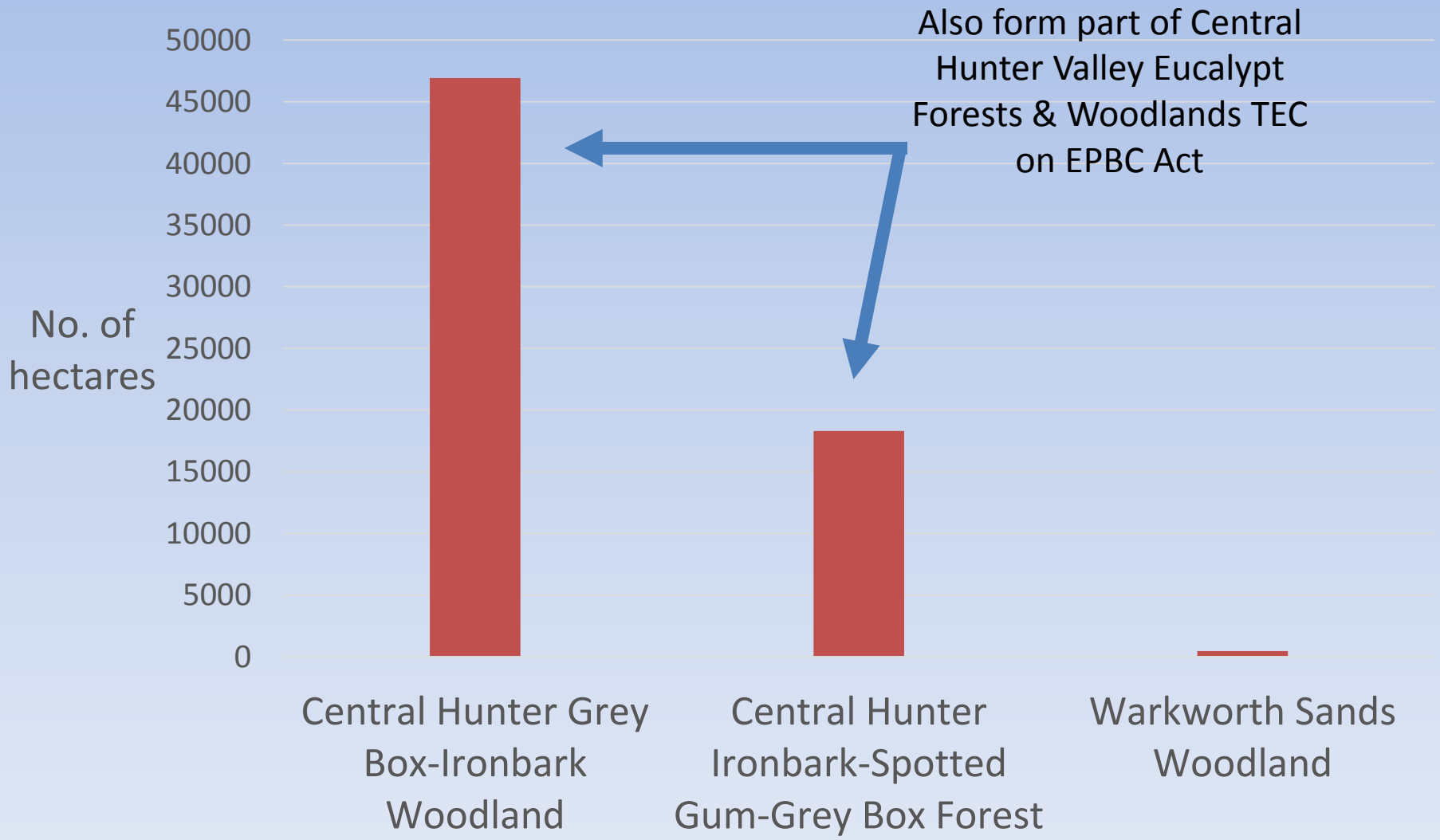
WSW Extent of Occurrence is 40 km^2

Citation: Keith DA, Rodrı´guez JP, Rodrı´guez-Clark KM, Nicholson E, Aapala K, et al. (2013) Scientific Foundations for an IUCN Red List of Ecosystems. *PLoS ONE* 8(5): e62111. doi:10.1371/journal.pone.0062111

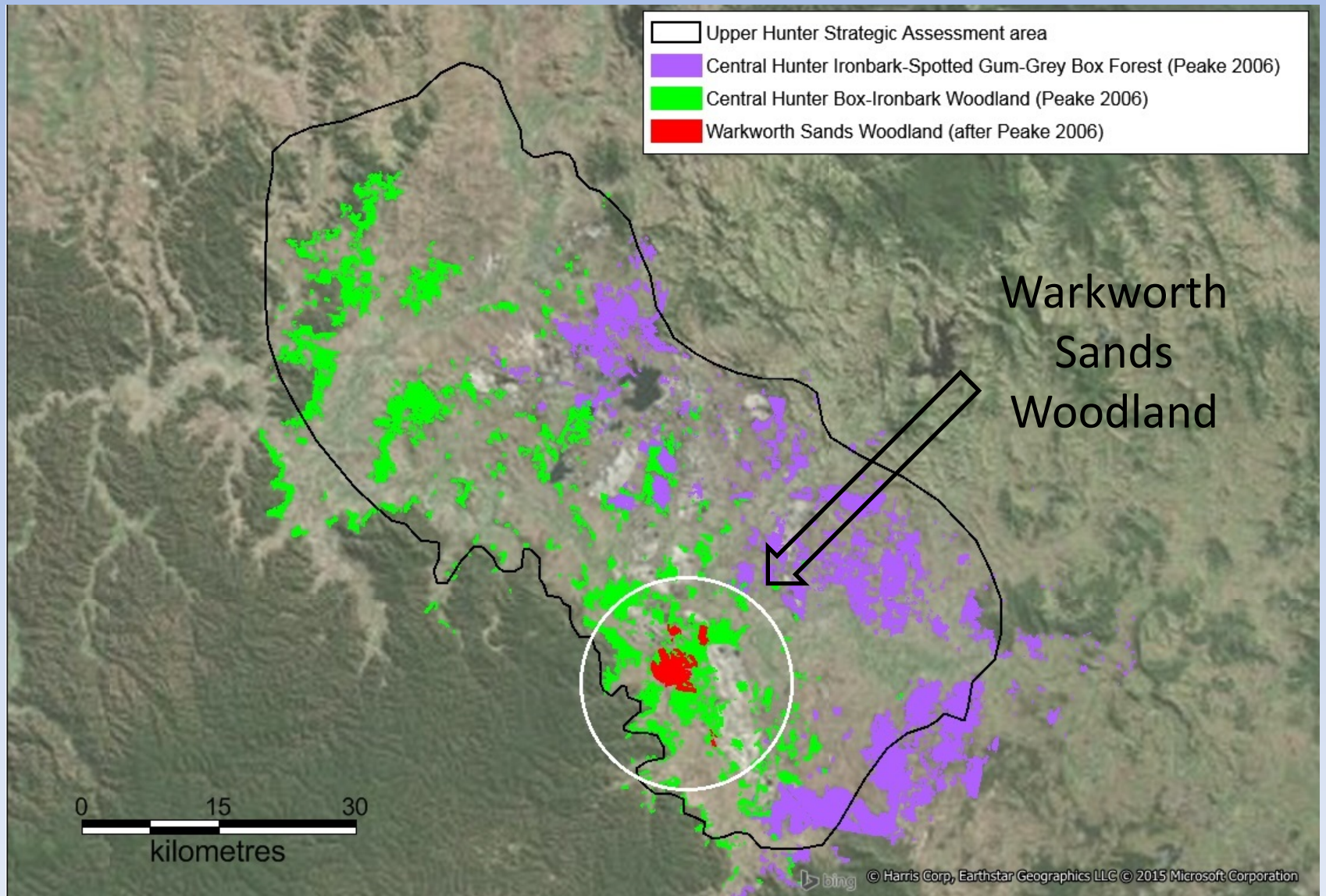
APPLYING IUCN RED LIST CRITERIA

Criterion B (Restricted Distribution)	Community	Occupancy Area (ha)	Extent of Occurrence (km^2)
Critically Endangered	Gnarled Mossy Cloud Forest (LHI)	28	20
Critically Endangered	Eastern Stirling Range Montane Heath (WA)	48	19
Critically Endangered	Busselton Ironstone Shrublands (WA)	170	357
Critically Endangered	Warkworth Sands Woodland (NSW)	426	40
Critically Endangered	Swamps of the Fleurieu Peninsula (SA)	500	-
Endangered	Coastal Sandstone Upland Swamps (NSW)	5360	4960
Endangered	Cumberland Plain Woodland (NSW)	11054	2810

HUNTER TECS IMPACTED BY MINES



TECS IMPACTED BY MINING



SUMMARY OF SIGNIFICANCE

- NSW — Endangered, but qualifies as Critically Endangered (TSC Act)
- Australia — Critically Endangered (qualifies)
- International — Critically Endangered (qualifies)

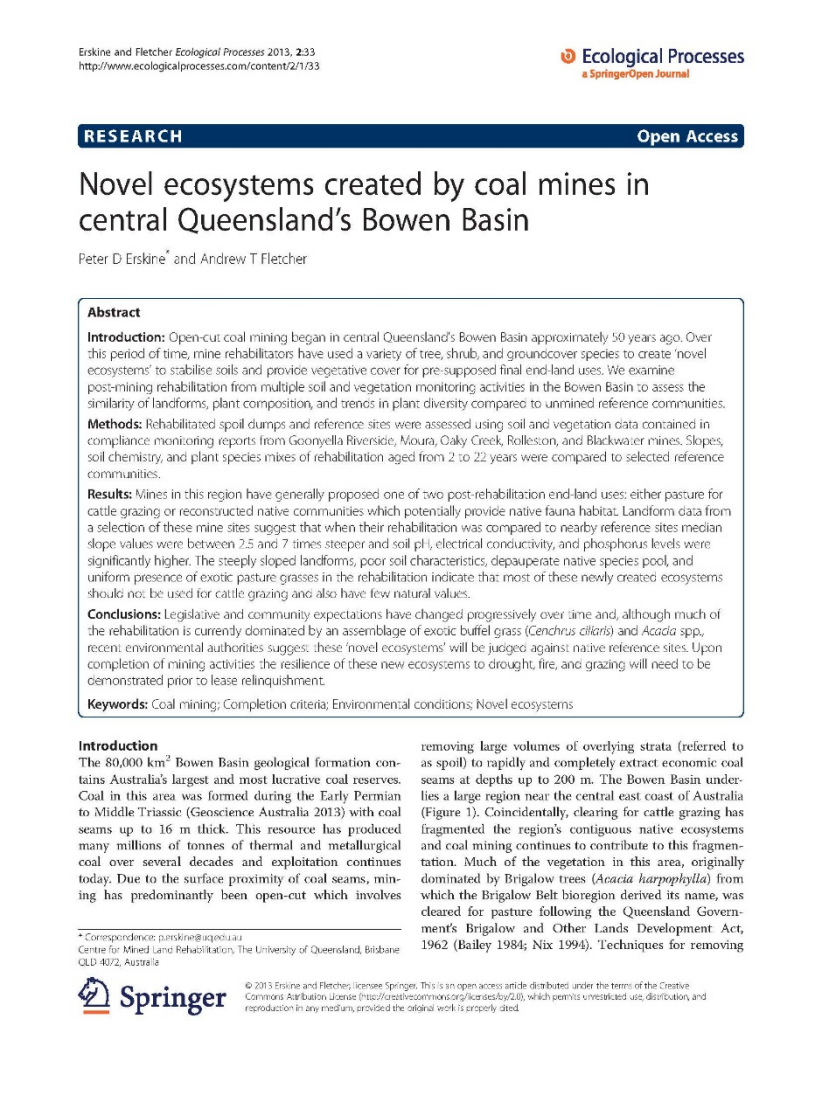
→ The next International (IUCN) category is COLLAPSED (the ecosystem equivalent of species extinction):

"*a transformation of identity, loss of defining features, and replacement by a novel ecosystem*."

RESTORATION PROMISES

- Mine restoration currently results in the development of ‘novel ecosystems’
- Novel ecosystems – new ecosystems that show resemblance to but are not equivalent to original ecosystems
- Restored WSW following mining is not the same as WSW that has not been mined

RESTORATION PROMISES



Erskine and Fletcher *Ecological Processes* 2013, **2**:33
http://www.ecologicalprocesses.com/content/2/1/33

Ecological Processes
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RESEARCH Open Access

Novel ecosystems created by coal mines in central Queensland's Bowen Basin

Peter D Erskine* and Andrew T Fletcher

Abstract

Introduction: Open-cut coal mining began in central Queensland's Bowen Basin approximately 50 years ago. Over this period of time, mine rehabilitators have used a variety of tree, shrub, and groundcover species to create 'novel ecosystems' to stabilise soils and provide vegetative cover for pre-supposed final end-land uses. We examine post-mining rehabilitation from multiple soil and vegetation monitoring activities in the Bowen Basin to assess the similarity of landforms, plant composition, and trends in plant diversity compared to unmined reference communities.

Methods: Rehabilitated spoil dumps and reference sites were assessed using soil and vegetation data contained in compliance monitoring reports from Goonyella Riverside, Moura, Oaky Creek, Rolleston, and Blackwater mines. Slopes, soil chemistry, and plant species mixes of rehabilitation aged from 2 to 22 years were compared to selected reference communities.

Results: Mines in this region have generally proposed one of two post-rehabilitation end-land uses: either pasture for cattle grazing or reconstructed native communities which potentially provide native fauna habitat. Landform data from a selection of these mine sites suggest that when their rehabilitation was compared to nearby reference sites median slope values were between 2.5 and 7 times steeper and soil pH, electrical conductivity, and phosphorus levels were significantly higher. The steeply sloped landforms, poor soil characteristics, depauperate native species pool, and uniform presence of exotic pasture grasses in the rehabilitation indicate that most of these newly created ecosystems should not be used for cattle grazing and also have few natural values.

Conclusions: Legislative and community expectations have changed progressively over time and, although much of the rehabilitation is currently dominated by an assemblage of exotic buffel grass (*Cenchrus ciliaris*) and *Acacia* spp., recent environmental authorities suggest these 'novel ecosystems' will be judged against native reference sites. Upon completion of mining activities the resilience of these new ecosystems to drought, fire, and grazing will need to be demonstrated prior to lease relinquishment.

Keywords: Coal mining; Completion criteria; Environmental conditions; Novel ecosystems

Introduction

The 80,000 km^2 Bowen Basin geological formation contains Australia's largest and most lucrative coal reserves. Coal in this area was formed during the Early Permian to Middle Triassic (Geoscience Australia 2013) with coal seams up to 16 m thick. This resource has produced many millions of tonnes of thermal and metallurgical coal over several decades and exploitation continues today. Due to the surface proximity of coal seams, mining has predominantly been open-cut which involves removing large volumes of overlying strata (referred to as spoil) to rapidly and completely extract economic coal seams at depths up to 200 m. The Bowen Basin underlies a large region near the central east coast of Australia (Figure 1). Coincidentally, clearing for cattle grazing has fragmented the region's contiguous native ecosystems and coal mining continues to contribute to this fragmentation. Much of the vegetation in this area, originally dominated by Brigalow trees (*Acacia harpophylla*) from which the Brigalow Belt bioregion derived its name, was cleared for pasture following the Queensland Government's Brigalow and Other Lands Development Act, 1962 (Bailey 1984; Nix 1994). Techniques for removing

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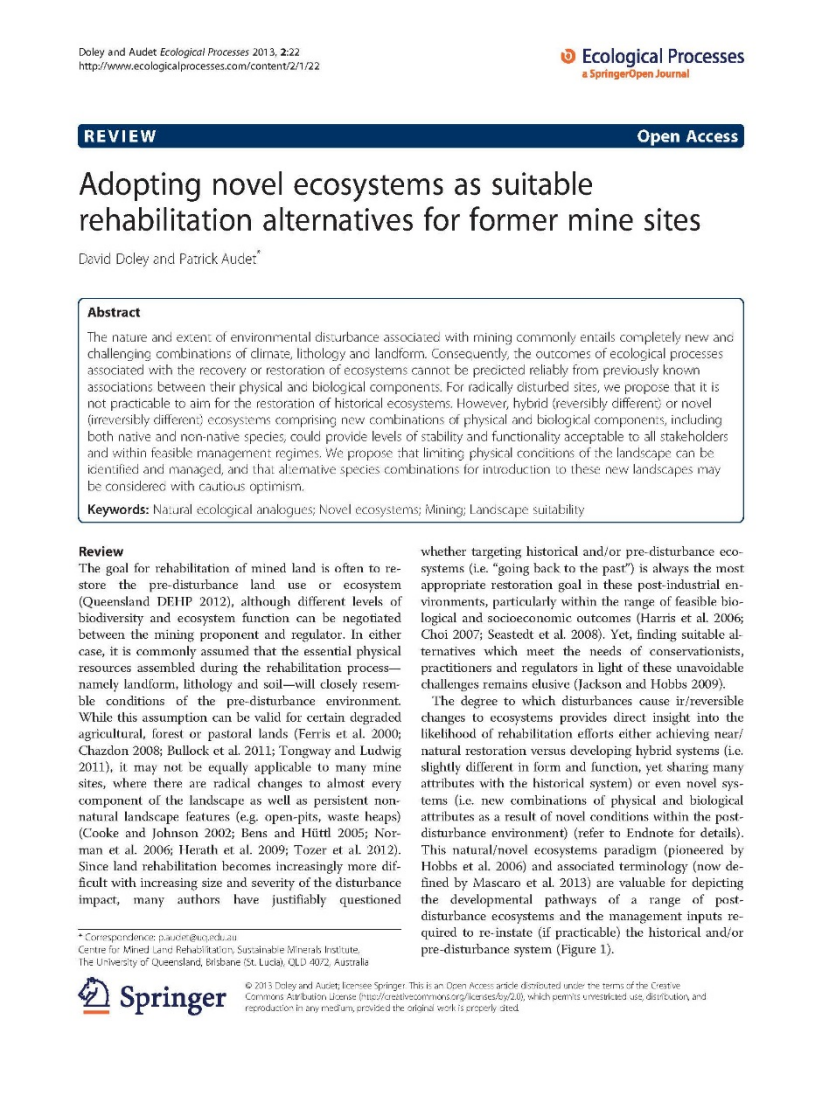
"*Our findings indicate that, where rehabilitation objectives aim to return disturbed lands following coal mining to a self-sustaining native community, these environments are unlikely to be as biologically diverse …*"

Erskine & Fletcher 2013

Citation: Erskine, P.D. and Fletcher, A. (2013) Novel ecosystems created by coal mines in central Queensland's Bowen Basin. *Ecological Processes* 2:33.

RESTORATION PROMISES



Doley and Audet *Ecological Processes* 2013, 2:22
http://www.ecologicalprocesses.com/content/2/1/22

Ecological Processes
a SpringerOpen Journal

REVIEW Open Access

Adopting novel ecosystems as suitable rehabilitation alternatives for former mine sites

David Doley and Patrick Audet*

Abstract

The nature and extent of environmental disturbance associated with mining commonly entails completely new and challenging combinations of climate, lithology and landform. Consequently, the outcomes of ecological processes associated with the recovery or restoration of ecosystems cannot be predicted reliably from previously known associations between their physical and biological components. For radically disturbed sites, we propose that it is not practicable to aim for the restoration of historical ecosystems. However, hybrid (reversibly different) or novel (irreversibly different) ecosystems comprising new combinations of physical and biological components, including both native and non-native species, could provide levels of stability and functionality acceptable to all stakeholders and within feasible management regimes. We propose that limiting physical conditions of the landscape can be identified and managed, and that alternative species combinations for introduction to these new landscapes may be considered with cautious optimism.

Keywords: Natural ecological analogues; Novel ecosystems; Mining; Landscape suitability

Review

The goal for rehabilitation of mined land is often to restore the pre-disturbance land use or ecosystem (Queensland DEHP 2012), although different levels of biodiversity and ecosystem function can be negotiated between the mining proponent and regulator. In either case, it is commonly assumed that the essential physical resources assembled during the rehabilitation process—namely landform, lithology and soil—will closely resemble conditions of the pre-disturbance environment. While this assumption can be valid for certain degraded agricultural, forest or pastoral lands (Ferris et al. 2000; Chazdon 2008; Bullock et al. 2011; Tongway and Ludwig 2011), it may not be equally applicable to many mine sites, where there are radical changes to almost every component of the landscape as well as persistent non-natural landscape features (e.g. open-pits, waste heaps) (Cooke and Johnson 2002; Bens and Hüttl 2005; Norman et al. 2006; Herath et al. 2009; Tozer et al. 2012). Since land rehabilitation becomes increasingly more difficult with increasing size and severity of the disturbance impact, many authors have justifiably questioned whether targeting historical and/or pre-disturbance ecosystems (i.e. "going back to the past") is always the most appropriate restoration goal in these post-industrial environments, particularly within the range of feasible biological and socioeconomic outcomes (Harris et al. 2006; Choi 2007; Seastedt et al. 2008). Yet, finding suitable alternatives which meet the needs of conservationists, practitioners and regulators in light of these unavoidable challenges remains elusive (Jackson and Hobbs 2009).

The degree to which disturbances cause ir/reversible changes to ecosystems provides direct insight into the likelihood of rehabilitation efforts either achieving near/natural restoration versus developing hybrid systems (i.e. slightly different in form and function, yet sharing many attributes with the historical system) or even novel systems (i.e. new combinations of physical and biological attributes as a result of novel conditions within the post-disturbance environment) (refer to Endnote for details). This natural/novel ecosystems paradigm (pioneered by Hobbs et al. 2006) and associated terminology (now defined by Mascaro et al. 2013) are valuable for depicting the developmental pathways of a range of post-disturbance ecosystems and the management inputs required to re-instate (if practicable) the historical and/or pre-disturbance system (Figure 1).

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"Rehabilitation of highly disturbed landscapes such as mine sites may not provide realistic opportunities for the ecological processes normally associated with ecosystem recovery to occur"

"Regardless of the final landscape, we conclude that it will not become self-managing but will always require some intervention, …."

Doley & Audet 2013

Citation: Doley, D. and Audet, P. (2013) Adopting novel ecosystems as suitable rehabilitation alternatives for former mine sites. *Ecological Processes* 2:22.

RESTORATION PROMISES

Measuring Success: Evaluating the Restoration of a Grassy Eucalypt Woodland on the Cumberland Plain, Sydney, Australia

S. Wilkins,[1] D. A. Keith,[2,3] and P. Adam[1]

Abstract

We compared the floristic composition and structure of restoration areas of eucalypt woodland with untreated pasture (control) and remnant vegetation (reference) in western Sydney. The restored areas comprised over 1,000 ha of abandoned pasture, which had been treated to reduce weeds and planted with seedlings of 26 native plant species raised from seed obtained locally from remnant vegetation. Plantings were carried out 0–9 years ago. Floristic composition was measured in quadrats using frequency scores and cover abundance. As far as possible treatments and restoration ages were replicated across sites. Ordination and analyses of similarity failed to distinguish the composition of restored vegetation from that of untreated pasture, which were both significantly different from that of remnant vegetation. There was a weak compositional trend with age of restored vegetation, but this was not in the direction of increasing resemblance to remnant vegetation. There was some evidence for convergence in structural features of restored with remnant vegetation, but this was at least partly attributed to plant growth. Subject to constraints imposed by the sampling design, environmental factors, and spatial variation were discounted as explanations for the results. The results therefore suggest either failure of restoration treatments or a restoration trajectory that is too slow to detect within 10 years of establishment. Our conclusions agree with those of similar studies in other ecosystems and support: (1) the need to monitor restoration projects against ecological criteria with rigorous sampling designs and analytical methods, (2) further development of restoration methods, and (3) regulatory approaches that seek to prevent damage to ecosystems rather than those predicated on replacing losses with reconstructed ecosystems.

Key words: ecological audit, field experiment, mitigation policy, restoration trajectory, succession.

Introduction

Restoration of native ecosystems is now a widely recognized imperative for both nature conservation and sustainable production (WRI, IUCN & UNEP 1992; Hobbs 1993). For example, in 2000–2001 the Australian government spent $36.4 million of its Bushcare Program on community grants for "practical works to re-establish native vegetation to provide habitat for wildlife, rehabilitate degraded lands and protect native vegetation" (Environment Australia 2001). Projects carried out under this and other programs enjoy extensive support in rural and urban communities, which more than doubles the monetary input with in-kind contributions of volunteer labor, knowledge capital, and equipment. The total financial input is likely to be substantially higher when expenditure by state governments and industry are accounted for. The success of these projects is reported in terms of administrative indicators. For example, Environment Australia (1999) reported the "major on-ground outputs" of its $27.1 million Bushcare funding included 10,000 ha directly revegetated, 4.5 million tubestock planted, and 12,000 km of fencing constructed. Yet these measures tell us little about the biological outcomes of the projects that are funded and implemented.

Unless administrative audits of the type routinely published in the annual reports of funding agencies are accompanied by ecological audits, it is impossible to know how much the sums invested, areas treated, and community commitment actually contributed to restoration of degraded ecological assets. A meaningful ecological audit of restoration projects must address the extent to which the restored areas follow a trajectory toward some specified target state that represents "natural" or undegraded conditions (Hobbs & Mooney 1993; Hobbs & Norton 1996; Zedler & Callaway 1999). Success may be assessed by measuring aspects of species composition, community structure, and ecosystem function.

Chapman and Underwood (2000) recently drew attention to the need for a scientific protocol to measure the biological success of restoration. A central component of their proposition was comparative monitoring and experimentation to address hypotheses about whether restored sites increase their resemblance to reference sites that represent a target state. Such an approach poses challenges to ecologists in deciding how to choose reference sites, how to select response variables and measure resemblance, and

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"*Our floristic analyses show no clear evidence for a restoration trajectory from untreated pasture to remnant vegetation.*"

"*The development of species composition in restored sites toward a state that resembles appropriate reference sites is … extremely slow and may not eventuate at all. …. time scales required … range from several decades and may extend to the order of centuries ….*"

Wilkins et al 2003

Citation: Wilkins, S., Keith, D.A. & Adam, P. (2003) Measuring success: evaluating the restoration of a grassy eucalypt woodland on the Cumberland Plain, Sydney, Australia. *Restoration Ecology 11 (4): 489–503*.

PROPOSED OFFSET RESTORATION

Grassland of Exotic Red Natal Grass

UNCLEARED WSW

Unmined & uncleared WSW

TOMAGO MINING RESTORATION

20 year old Blackbutt – Apple Forest

TOMAGO UNMINED FOREST

Unmined Blackbutt – Apple Forest

SUMMARY OF RESTORATION

- No evidence in the literature for successful restoration of mined lands, certainly not within 15 years. At best, the creation of 'novel ecosystems' will be returned
- Restoration of mined land at Tomago has not successfully returned unmined coastal sand ecosystems after 20+ years; similar results are likely at Warkworth
- These novel ecosystems are representative of a COLLAPSED ecosystem under Red List IUCN categories, so restored lands should no longer be considered WSW, nor should they be used as offsets

CONCLUSIONS

1. Warkworth Sands Woodland qualifies as a Critically Endangered ecosystem in NSW, Nationally and Internationally, possibly on the brink of collapse. We should not accept any further loss from the 426ha that remains.
2. Proposed restoration of Warkworth Sands Woodland will only result in a Novel Ecosystem, indicative of a Collapsed Ecosystem under Red List criteria. Restored Warkworth Sands Woodland should not be accepted as a viable offset measure.

Coal and health in the Hunter:
Lessons from one valley for the world

CLIMATE AND HEALTH ALLIANCE

Background to this report

This report has been produced on behalf of the Climate and Health Alliance (CAHA) to support its advocacy for the protection and promotion of health from the impacts of climate change and environmental degradation. The health implications of energy policy are a key concern for CAHA and highlighting the risks to health from energy choices is a core element of its work.

This report was developed using a combination of sources, including international and national health and medical literature on coal and health, as well as grey literature, including submissions to government inquiries, academic, scientific and industry reports, reports from think tanks, community organisations, and media and from interviews with local community members and experts. It represents an analysis and synthesis of the selected sources. It is not a systematic scientific review.

This report aims to highlight the risks to health associated with the rapid expansion of coal mining in the Hunter Valley for the local population as well as the risk to the global community from the contribution to climate change from coal exports. It is aimed at politicians, policymakers, media, those advocating for policy change, health professionals, and communities affected by coal mining and combustion, in the Hunter Valley and elsewhere.

A website with the report, full set of recommendations, a summary for policymakers, infographics, additional images and short videos is available at: http://caha.org.au/ projects/hunter-coal/

About the Climate and Health Alliance

The Climate and Health Alliance (CAHA) is a not-for-profit organisation dedicated to protecting and promoting health from the adverse impacts of climate change and environmental degradation, and promoting sustainable healthcare. Its members include health professional organisations representing doctors, nurses and midwives, psychologists, physiotherapists, social workers, rural and remote nurses and allied health professionals, as well as healthcare service providers, academic institutions, primary healthcare services, health consumers, and individual health professionals. It is the Australian affiliate of the international not-for-profit organisation Health Care Without Harm.

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- Dr James Whelan
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- Herve Senot
- Paul Szuster
- Bridget Ryan

The analysis of the economic costs associated with health impacts and social costs of carbon have been reviewed and independently verified by Economists at Large (see Appendix B for further details).

Written by Fiona Armstrong

Any errors are those of the Climate and Health Alliance.

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Contents

Quick facts

Coal from the Hunter Valley is **Australia's largest single source of carbon dioxide** (CO_2) emissions to the atmosphere.[2]

The Hunter Valley is responsible for around **two-thirds of NSW coal production**.[3]

Coal from the Hunter Valley is currently responsible for the **production of around 348 million tonnes of carbon dioxide equivalent each year**.[4]

1. Executive summary

The rapid expansion of the coal industry in the Hunter Valley is out of step with the global requirement to reduce greenhouse gas emissions, and is leading to increasing concerns about adverse impacts on local communities and the state's economy.

The production of coal is one of the most greenhouse gas intensive activities in the world, and is one of the main drivers of climate change – considered the biggest threat to global public health.

Coal production also poses serious risks to the health of local communities, as well as causing substantial environmental damage – both of which incur substantial economic costs.

The impacts on local communities in the Hunter Valley include exposure to harmful air, noise and water pollution, distress associated with social disruption, and a sense of abandonment as government's prioritise the interests of the coal industry above that of the community. Government regulations are failing to protect the community and the Hunter Valley's natural assets from the negative impacts of the region's intensive coal mining and coal combustion industries.

Air quality monitoring in the region demonstrates the residents of the rural village of Camberwell are being exposed to higher levels of air pollution than some inner Sydney suburbs. As a major coal export hub, parts of the city of Newcastle are already experiencing intolerable levels of coal dust, and a proposed fourth coal export terminal threatens to increase by 50 per cent the number of coal trains (to approximately 42,000 each year) passing through the city.

Estimated costs of health damages associated with coal combustion for electricity in Australia amount to $2.6 billion per annum. This report estimates the annual costs of associated health damages from the five coal fired power station in the Hunter Valley at around $600 million per annum.

For the towns of Singleton and Muswellbrook, the burden of health damages is estimated at $47 million in Singleton and $18.3 million in Muswellbrook each year from exposure to fine particles (PM2.5) emitted from coal mines and coal fired power stations into the air. These particles travel deep into the lungs and pass into the blood stream, posing a risk of stroke and heart attacks.

This report uses published estimates of the economic costs associated with the local health impacts as well as wider global impacts (the social costs of carbon) associated with Hunter Valley coal, outlined in the tables below.

Table 1: The local health costs of coal in the Hunter Valley

Source of health damage	Value of health costs
Externalised health costs associated with pollution from five coal fired electricity generators in the Hunter Valley	$600 million per annum
Health costs associated with fine particle pollution (PM2.5) from coal sources (coal mines and coal fired power stations) in Singleton	$47 million per annum
Health costs associated with fine particle pollution (PM2.5) from coal sources (coal mines and coal fired power stations) in Muswellbrook	$18.3 million per annum
Health costs associated with air pollution (PM10) from coal sources in Newcastle	$13 million per annum

Table 2: Social costs of carbon associated with Hunter Valley coal

Estimates of the social costs of carbon (SCC)	Current production volume of Hunter Valley coal	Social cost of carbon associated with Hunter Valley coal
$37/tonne CO_2e – $190/tonne CO_2e	145 million tonnes per annum	$16 billion – $66 billion per annum

Despite these serious and costly impacts, recent changes to planning laws remove the rights of communities to contest proposed projects. The views of health experts and community members have little impact on policy and approvals, and projects are failing to account for greenhouse emissions, human health and broader environmental impacts.

Insights into the impacts on individuals and communities are provided in the report's case studies (and via video), illustrating the adverse impacts of air pollution, noise, disempowerment, and a failure to adequately research or regulate to prevent adverse impacts on individuals and the broader community.

The recommendations accompanying this report call for:

- A ban on new coal projects in the Hunter Valley
- The development of a transition plan to assist the region develop new industries as coal is phased out
- Stronger regulation of any projects in the planning pipeline to adequately evaluate and limit health, climate, and environmental damages
- Stricter air quality standards and monitoring of all coal sources, with data publicly available
- Increased consultation with communities affected by coal projects
- The implementation of mandatory health impact assessments as part of all project assessment processes still in the planning phase
- Comprehensive health research studies to evaluate
  - the environmental health risks faced by local communities from exposure to pollutants associated with the coal industry, and
  - the social impacts associated with disruption to communities, to landscapes, ecosystems and other industries.

Photo © Leo Farrell

2. Introduction: local, state, global impacts

The Hunter Valley is one of the largest river valleys in the Australian state of New South Wales and stretches from the coastal towns of Newcastle and Lake Macquarie in the southeast to the rugged ranges of the Barrington Tops in the north and west past the Merriwa Plateau.

The valley floor is rich in carbon formed from the fossilisation of plants during the Permian period, over 200 million years ago. Over the intervening period, that carbon became coal.

Traditionally regarded as a bucolic rural landscape of rolling green hills and fertile farmland, little in the Valley now remains untouched by coal mining. While mining coal has been part of the Hunter Valley history over the last two centuries, there has been an explosion in coal mining activity in the region over the past decade which means many local communities (and other industries) are literally surrounded by coal mines.

There are widespread community concerns that the expansion of mining in the Hunter Valley is occurring at the expense of community wellbeing and natural ecosystems, including the clean air, water and soil that support the other important regional industries of viticulture and winemaking, thoroughbred breeding, farming and agriculture, and tourism.

Health and medical literature points to serious harm to human health from all stages of the coal lifecycle – including mine development, mining activities, and coal transportation and combustion (collectively called 'coal production' in this report).

The risks to health can be both physical and psychological, and arise from direct causes such as air pollution and water contamination, and less directly from economic burdens, emotional distress, social conflict, ecological degradation, loss of biodiversity and climate change.

The coal mined and burned in the Hunter Valley and exported to other countries poses risks not only for the health and wellbeing of local communities, but also for communities where the exported coal is burned and, because of coal's significant contribution to climate change, for communities around the world.

Hunter Valley coal produces around 348 million tonnes of carbon dioxide (CO_2) each year,[6] making it Australia's largest single source of CO_2. These emissions are generated from the coal-fired power stations and other industries in the region, and from the 126 million tonnes of Hunter Valley coal exported annually to be burnt in power stations in Japan, Taiwan, Korea, and other destinations.[7]

Of all the energy sources, coal is the single biggest contributor to greenhouse gas emissions and a major driver of climate change.

Climate change poses the most serious risk to global public health this century and averting further global warming is an international public health priority.[8] Climate change is already a leading global cause of death, and is responsible for 400,000 deaths globally each year.[9] The annual toll of the global intensive carbon economy is estimated at 4.5 million deaths, mainly from air pollution, hazardous occupations and cancer.[10]

The harm to health, industry and infrastructure from climate change costs the global economy more than one trillion dollars annually.[11]

The impacts on people's health from climate change are already significant and intensifying: including illnesses, injuries and deaths from cyclones, storms, bushfires and floods; increasing deaths from heatwaves; changes to the spread of climate sensitive infectious diseases; and issues such as malnutrition and stunting among children in developing nations from declining food yields.[12]

The greatest threat to human health and survival comes from the harm to life-supporting systems of the biosphere. The only ways to address that threat are a rapid transition to renewable energy and halting the destruction of natural assets and ecosystems.[13] Continued exploitation of coal and other fossil fuels is anticipated to drive global warming beyond safe climate limits.[14] Estimates of the available carbon 'budget' indicate only one-fifth of proven reserves of fossil fuels can be burned before 2050 if we are to reduce the likelihood of exceeding 2°C warming above pre-industrial temperatures.[15] If all the coal reserves from the Hunter Valley are mined and burnt, it will limit the chances for the world to meet that goal.

Many countries around the world, including Australia, are already experiencing significant negative and costly impacts from global warming on health and wellbeing, on agriculture, and on infrastructure. The further exploitation of coal resources for domestic production and export is inconsistent with global public health and safe climate goals.

Once an unquestioned source of economic prosperity, the damage caused by coal to people's health, natural capital and the global climate has led to closer scrutiny of its impacts.

The evidence suggests coal is becoming an unwelcome social and economic burden, and a risk to community wellbeing, the economy and a safe climate.

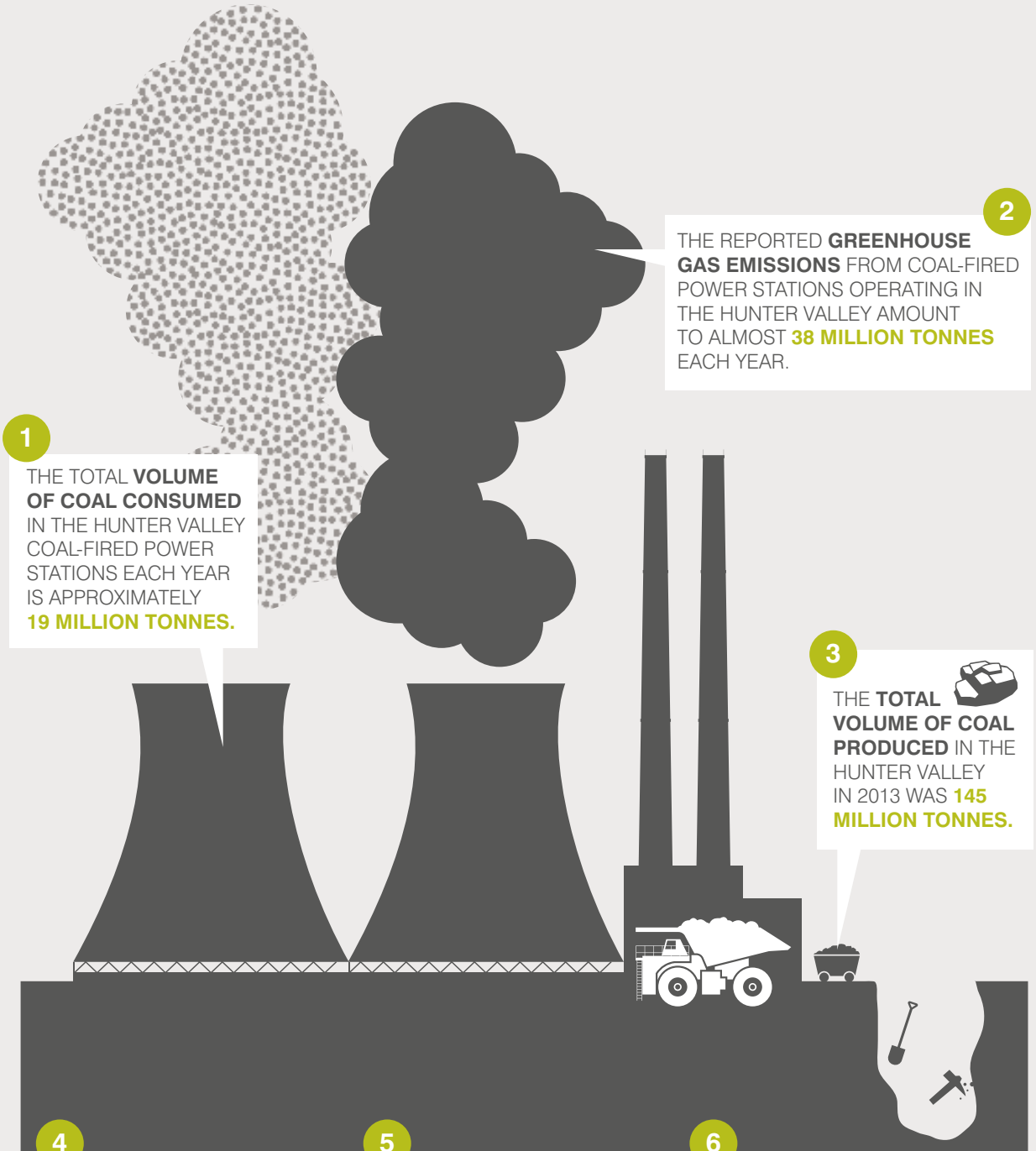
This paper will review the health risks of coal mining in the Hunter Valley as well as the global impacts associated with the unprecedented expansion within the region.

Carbon emissions from Hunter Valley coal

- The total volume of coal consumed in the Hunter Valley coal-fired power stations each year is approximately 19 million tonnes.[16]
- The reported greenhouse gas emissions from coal-fired power stations operating in the Hunter Valley amount to almost 38 million tonnes each year.[17]
- The total volume of coal produced in the Hunter Valley in 2013 was 145 million tonnes.[18]
- Government sources however suggest a conversion factor of 2.4 ie each tonne of coal burned generates around 2.4 tonnes of carbon dioxide equivalent.[19]
- This suggests the total annual emissions arising from the total volume of coal mined in the Hunter Valley in 2012-13: 145 million tonnes x 2.4 = 348 million tonnes of carbon dioxide equivalent (CO^2e).[20]
- Projected for future growth put production is expected to reach 243 million tonnes per annum in 2022, when total annual greenhouse gas emissions from coal production in the Hunter Valley could reach 583 million tonnes of carbon dioxide equivalent.[21]

Carbon emissions from Hunter Valley coal

HUNTER VALLEY COAL



1 THE TOTAL **VOLUME OF COAL CONSUMED** IN THE HUNTER VALLEY COAL-FIRED POWER STATIONS EACH YEAR IS APPROXIMATELY **19 MILLION TONNES.**

2 THE REPORTED **GREENHOUSE GAS EMISSIONS** FROM COAL-FIRED POWER STATIONS OPERATING IN THE HUNTER VALLEY AMOUNT TO ALMOST **38 MILLION TONNES** EACH YEAR.

3 THE **TOTAL VOLUME OF COAL PRODUCED** IN THE HUNTER VALLEY IN 2013 WAS **145 MILLION TONNES.**

4 **GOVERNMENT SOURCES** SUGGEST A CONVERSION FACTOR OF 2.4 ie EACH TONNE OF COAL BURNED GENERATES AROUND **2.4 TONNES OF CARBON DIOXIDE** EQUIVALENT (CO_2E).

5 SUGGESTING THE **TOTAL ANNUAL EMISSIONS** ARISING FROM THE TOTAL VOLUME OF COAL MINED IN THE HUNTER VALLEY IN 2012–13:

145 (MILLION TONNES) x **2.4** = **348** MILLION TONNES OF CARBON DIOXIDE EQUIVALENT

6 PROJECTIONS INDICATE **COAL PRODUCTION** MAY REACH 243 MILLION TONNES PER ANNUM IN 2022, WHEN EMISSIONS FROM COAL PRODUCTION IN THE HUNTER VALLEY COULD REACH **583 MILLION TONNES OF CARBON DIOXIDE EQUIVALENT**.

3. Coal operations in the Hunter Valley

There are currently 31 coal mining operation sites in the Hunter Valley, including 22 open cut and 17 underground mines (eight sites have both), and five coal-fired power stations. These mines currently produce 145 million tonnes of coal per annum (Mtpa).[22] In 1999, the coal mines were estimated to collectively account for a land surface area of 520 square kilometres.[23] Mining exploration leases cover 128,000ha, or 64%, of the Hunter Valley floor.[24]

Coal production from the region has increased dramatically in recent decades, as the figure below illustrates.[25]

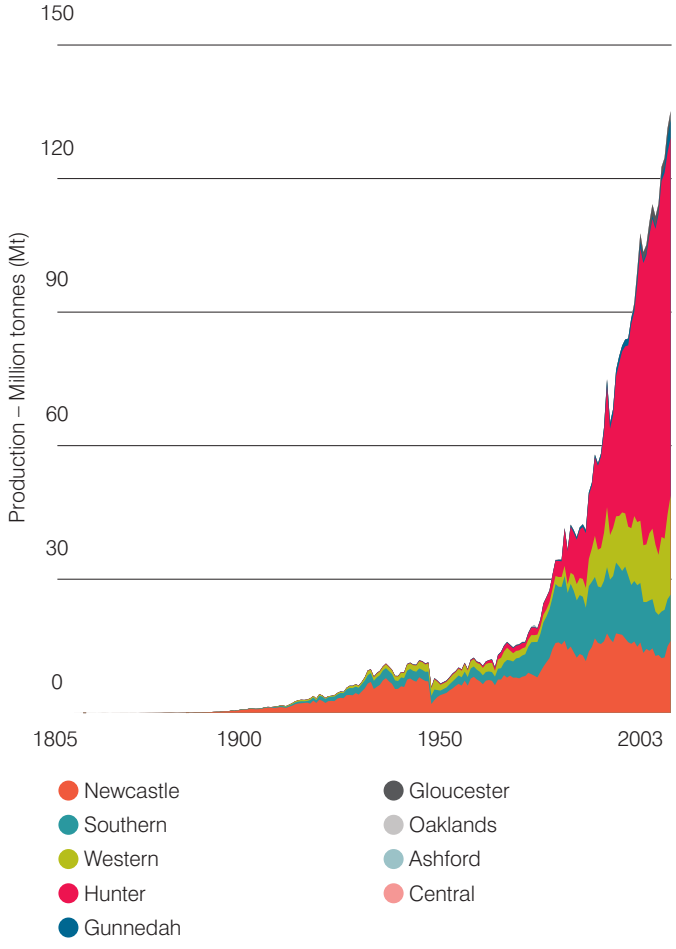


Figure 1: NSW coal production trends

Around 19 million tonnes of coal is burned in the region's coal-fired electric power stations,[26] and the remainder exported via the Port of Newcastle, site of the largest coal export terminals in the world.

There are at least 21 additional coal mines proposed for the Hunter Valley, either as expansions of existing mines or new projects.

Projections of growth suggest coal production in the Hunter Valley could reach 243 Mtpa by 2022.[27]

3.1 Coal mining

Open cut mining in the Hunter Valley involves drilling and blasting through rocks covering the coal seam, which is then removed by large dragline excavators and electric or hydraulic shovels and trucks.[28,29] Draglines work in strips that are typically 40 to 90 metres wide and a few kilometres long.[30] Mining waste known as 'overburden' (waste soil removed to access coal seams) is excavated by the dragline and dumped adjacent to the mine, creating mountains of dusty waste.[31] Each tonne of coal excavated from an open cut coal mine creates approximately 6m^3 of overburden.[32] The large scale of open cut operations, with some mines up to eight kilometres long and 200 metres deep,[33,34] leaves large 'voids' in the landscape following mine closure.

Underground mining in the Hunter largely used the 'longwall' method, in which mechanical shears cut through coal in long deep tunnels. Once coal is removed from the underground mine, the supports are moved forward and the roof is collapsed behind them, which can result in subsidence of the earth above.[35]

This can impact dramatically on water catchments through damage to swamps and vegetation that protects water from evaporation and loss and by cracking of river beds and draining water into deep inaccessible aquifers.[36]

Dust and particulate matter arise from coal mining, from blasting (using explosives to blast through rocks covering coal seams), wind erosion of large areas of 'overburden', unpaved roads around mine sites, and the use of dragline excavators.[37]

The use of explosives for blasting also produces toxic gases hazardous to health.[38]

3.2 Transport

Coal is washed at coal preparation plants, and transported to coal-fired power stations in the region or via rail to coal export terminals in Newcastle. Coal dust and particulates are produced when coal is transported, loaded and unloaded, and when blown by the wind from coal stockpiles and piles of overburden.

Each year 22,000 trains with four million coal wagons travel through the Hunter Valley to the port of Newcastle.[39] Each wagon is uncovered, so there is no barrier to wind blowing coal dust along the rail corridor, across communities in the Hunter and in the city of Newcastle, which is home to the world's biggest coal export terminal.

Diesel powered coal trains, trucks and other heavy vehicles and machinery used in the coal mining industry also produce air emissions that can be harmful to health. Around 50 per cent of non-road diesel emissions in Australia are estimated to come from mining and construction.[40,41]

Diesel emissions include particulates, carbon dioxide (CO_2), carbon monoxide (CO), oxides of nitrogen, polycyclic aromatic hydrocarbons (PAH), dioxins and furans, and a range of volatile organic compounds (VOCs).[42]

In addition, coal dust arises from coal stockpiles, both prior to transportation and at the port prior to export. Air quality is assessed according to the New South Wales Environment Protection Agency's PM10 air quality standard (measuring particles of less than 10 micrometers in diameter).

These particles are likely responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract.

In addition to air emissions from transport, the increased volume of traffic on the region's roads from increased mining activity has prompted health and community concerns about a higher risk of road trauma.[43]

A 2005 study found there were 29 car crashes involving vehicles travelling to and from coal mines in New South Wales each year, with associated injuries and deaths amounting to a cost of $4.5 million (2002$) each year.[44]

3.3 Combustion for electricity

There are five coal-fired power stations in the Hunter Valley, including two of Australia's most polluting: Bayswater and Eraring, which together with Liddell, Vales Point and Redbank power stations produced 38 million tonnes of greenhouse gas emissions in the financial year 2012–13.[45] (The Redbank power station went into receivership in October 2013, and was not operating at time of writing.)

Reported emissions from Hunter Valley power stations were 38Mtpa in 2012–13, around one-fifth of Australian total power station emissions (184Mtpa).[46]

The process for preparing coal for generating electricity from coal involves crushing chunks into a fine powder, which is fed into a combustion chamber where it is burned. Heat from the burning coal is used to produce steam that drives one or more turbines to generate electricity. The waste gases from the combustion process are typically expelled into the air through a tall stack after filtering. Waste heat is extracted through cooling towers, requiring a steady supply of fresh water.

As well as producing greenhouse gas emissions, burning coal for electricity in the Hunter Valley power stations produces large quantities of hazardous air pollutants including particulate matter, sulphur dioxide, oxides of nitrogen, carbon monoxide, hydrochloric acid, volatile organic compounds and polyaromatic hydrocarbons.[47]

These pollutants threaten human health at the local level by affecting people's cardiovascular, respiratory and nervous systems, and reproductive health.[48,49]

3.4 Coal waste

Coal mining produces large quantities of waste products, such as coal 'slurry' which, along with coal ash waste from coal combustion, also pose risks to human health due to the presence of toxic pollutants.[50]

Slurry is produced in the process of washing coal prior to transport for export or combustion. This process uses large quantities of water and creates a liquid waste that may contain heavy metals, and other toxic pollutants.

A Hunter Valley mine operator, Bulga Coal Management, was recently fined $64,000 when hundreds of litres of coal slurry leaked from a containment dam into the nearby Nine Mile Creek.[51]

3. Coal operations in the Hunter Valley

4. Health impacts of coal in the Hunter Valley and beyond

International health and medical research has documented the contribution of coal to the development of heart and lung disease, including lung cancer, kidney disease, impacts on neurological development and, in relation to combustion, effects on reproductive health, as well as premature deaths.[52]

In the Hunter Valley, health concerns associated with the rapid expansion of coal mining include:

- declining air quality from coal dust and other air emissions
- exposure to toxic gases from explosive blast plumes, transport and combustion
- potential for water contamination
- noise and light pollution from 24 hour mining operations
- social disruption and destruction of communities as mining companies buy out houses, farms, and small villages
- damage to fragile, remnant or threatened natural ecosystems
- aesthetic impacts from changes to the landscape
- health risks associated with global warming.

Internationally, pollutants produced by coal combustion pose direct and immediate risks to human health and have been identified as among the leading contributors to poor air quality globally.[53]

Estimates of the annual global health toll from coal combustion range from 210,000 – 387,000 deaths, almost two million serious illnesses and over 151 million minor illnesses.[54] (NB. These figures do not represent a complete global picture and do not reflect the health toll from other parts of the coal production chain.)

Many of those deaths occur in developing nations, where power plant emissions controls are less stringent than in Australia, creating a profound ethical dilemma for Australia as the world's biggest coal exporter.[55,56]

4.1 Pollution – air, noise and water

4.1.1 Air pollution

There is a considerable body of evidence on the adverse health impacts of outdoor air pollution. Risks relate predominantly to cardiovascular and respiratory health, lung cancer,[57] and premature death.[58]

Air pollution is an increasing concern for many people and communities in the Hunter Valley, and is a significant health problem for New South Wales more broadly. The major contributors are industrial activity (including mining), motor vehicle exhaust and coal-fired power generation.[59]

Air pollution from coal mining, transport and combustion for electricity is not always visible but it carries serious and well documented risks to health, and can travel long distances, affecting people far from the source.[60]

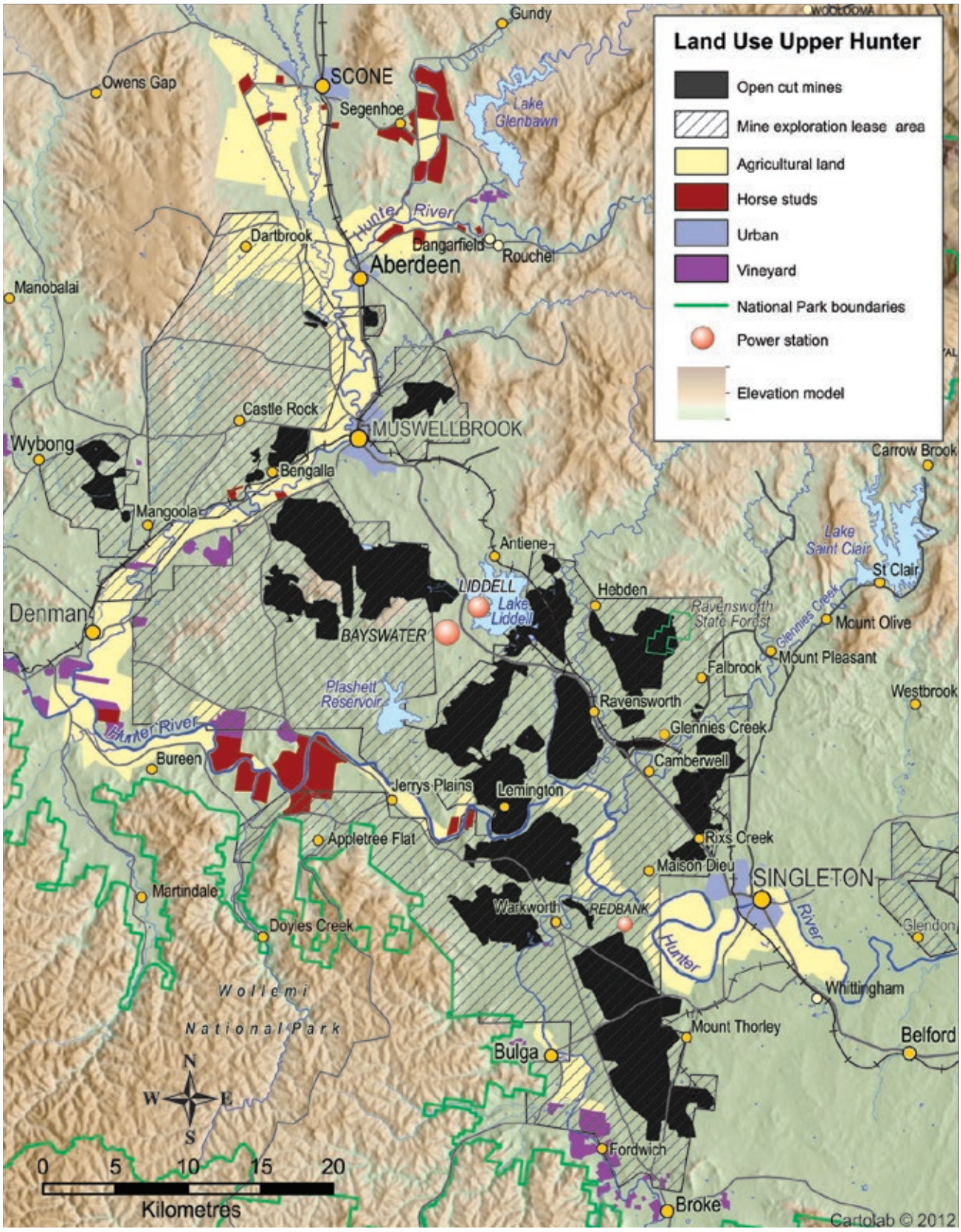
Many of the mines and power stations in the Hunter Valley are close to populated areas and towns.

The Muswellbrook, Bengalla, and Mount Arthur coal mines are just three, four and five kilometres respectively from the town of Muswellbrook.

The town of Camberwell is surrounded by coal mines: Integra mine to the north, Narama to the west, Ashton to the south, and there is a proposal for a new open cut mine to the east.

Liddell and Bayswater Power Stations are both around 15 kilometres away from Muswellbrook, while the Vales Point power station is just one kilometre away from the town of Mannering Park; Eraring power station is just three kilometres away from the town of Morriset.

Figure 2. Coal mines close to the towns of Singleton, Muswellbrook and Camberwell



Of all the air pollutants produced by coal mining activities, particulate matter is the most significant health threat.

Most health and medical research on particulates has focused on fine particles known as PM2.5 (measuring less than 2.5 micrometres in diameter) and PM10 (less than ten micrometres in diameter) as these are associated with the most significant health impacts.

The National Environment Protection (Ambient Air Quality) Measure (NEPM) developed in 1998 sets uniform national ambient air quality standards for six air pollutants: carbon monoxide; lead; sulphur dioxide; nitrogen dioxide; ozone and particles with diameter less than 10 μm (PM10).

In 2003, an advisory reporting standard for particles with a diameter less than 2.5 μm (PM2.5) was added. However, having no air quality standard for PM2.5 puts Australia out-of-step with the World Health Organisation (WHO) guidelines.

Australia's air pollution standards and implementation practices are outdated and do not reflect current air pollution science, although they are under review. The current approach is to regulate to certain air quality targets as the standard, when in fact exposure to air pollution at the standard itself is not safe, and aiming to regulate to keep air quality from exceeding the (known to be inadequate) standard will fail to bring about reductions in air pollution to safer levels. (See Appendix A for more details).

Particulates in the Hunter Valley

Once renowned for its clean air, the Hunter Valley was identified in 2014 as an air pollution 'hotspot',[61] with the national standard for PM10 exceeded 118 times in 2013 across 11 air quality monitors in the Upper Hunter.[62]

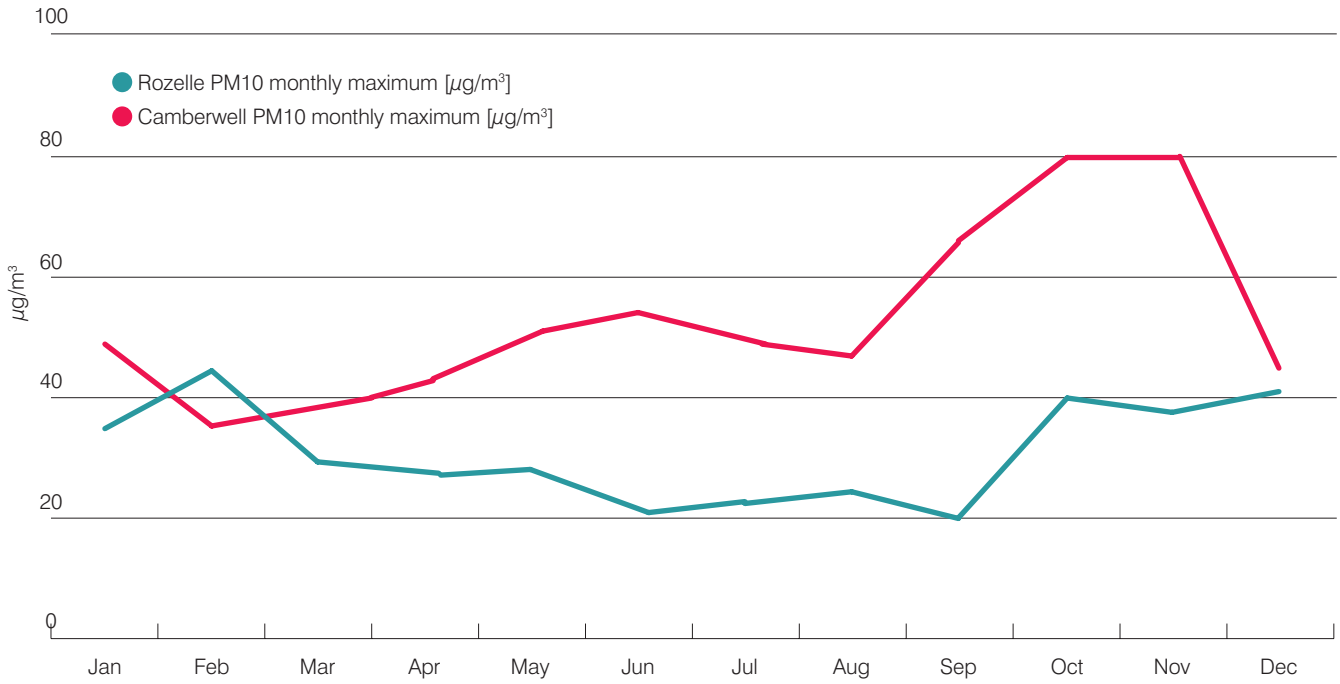
The most recent New South Wales Air Emissions Inventory (published in 2012 using 2008 data) indicates emissions of PM10 in the Sydney Greater Metropolitan Region (GMR) increased 20 per cent from 1992 to 2008, an increase largely attributed to increased coal mining in the Hunter Valley.[63]

Data released in February 2013 from the recently installed Upper Hunter Air Quality Monitoring Network (UHAQMN) shows particle pollution in the population centres of Singleton and Muswellbrook exceeded national standards and was higher than the network average for the GMR.[64]

Air quality monitoring records reveal that, in the regional towns of Singleton and Muswellbrook and the village of Camberwell, national air quality standards for PM10 were breached 12 times in Singleton, three times in Muswellbrook and 36 times in Camberwell in 2013.[65]

Despite being a rural village, Camberwell has higher monthly maximum levels of PM10 than Rozelle, a suburb in Sydney's inner west.[66]

Figure 3. Monthly maximum levels of PM10 in Camberwell (Hunter Valley) and Rozelle (inner western Sydney) in 2014



According to the New South Wales Environment Protection Agency, the dominant source of particle emissions in the Upper Hunter is coal mining (87.6 per cent of PM10 and 66 per cent of PM2.5).[67]

Other significant sources of fine particulates are power generation (13.5 per cent of PM2.5 and 5.6 per cent of PM_{10}) and non-road diesel equipment (13.2 per cent of PM2.5 and 3.1 per cent of PM10).[68]

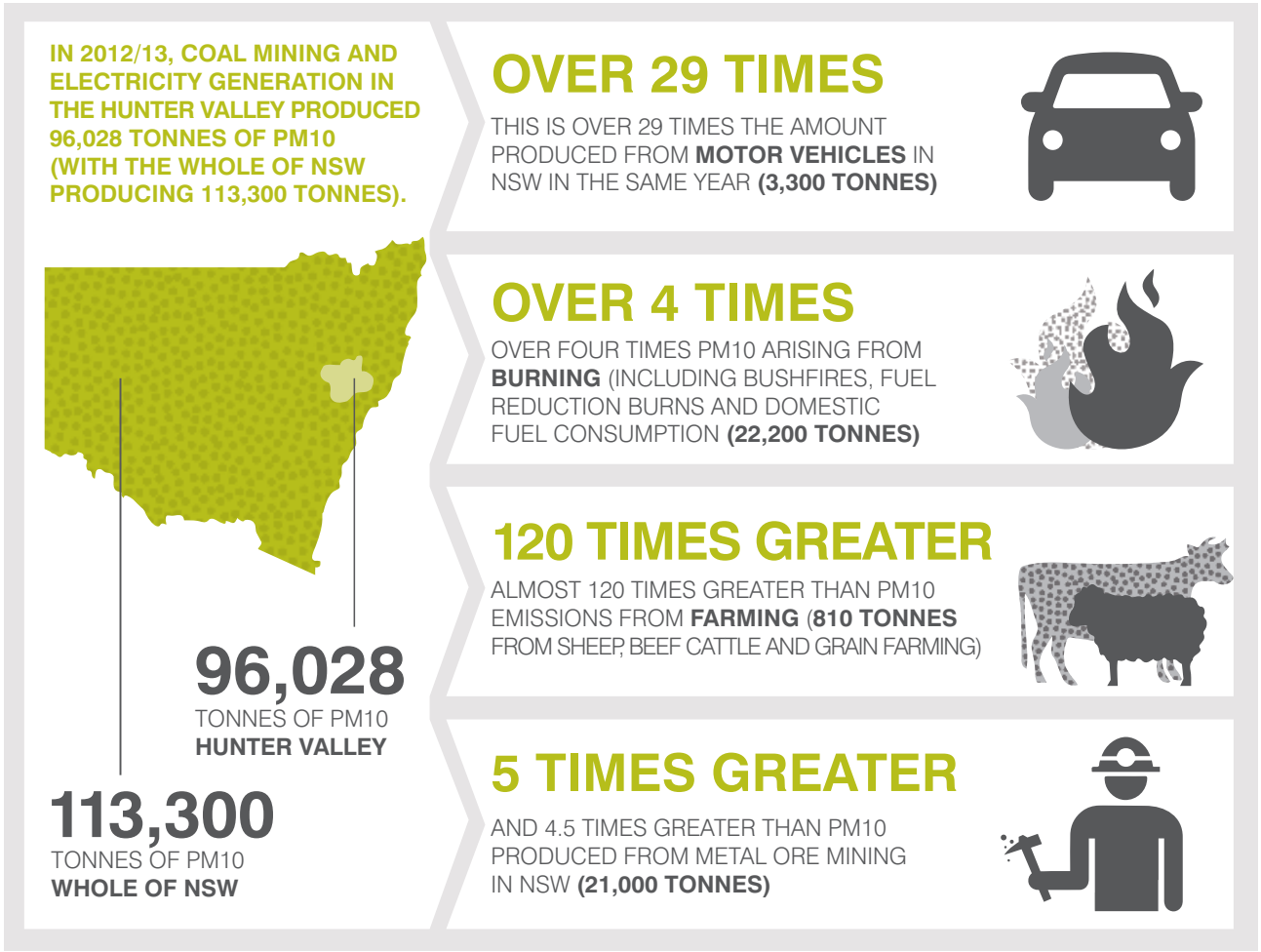
A recent study by the Commonwealth Scientific Investigation and Research Organisation (CSIRO) investigating the sources of PM2.5 in Singleton and Muswellbrook found the main sources of PM2.5 in Singleton were secondary sulphate (from power stations); industry aged sea salt;[69] and vehicles/ industry. For Muswellbrook, the top three factors were wood smoke, secondary sulphate, and industry aged sea salt.[70]

Vehicle exhaust, which produces emissions of nitrogen dioxide and sulphur dioxide, is another source of air pollution in the Hunter Valley and in the towns of Muswellbrook and Singleton.[71]

In the Lower Hunter, community air quality monitoring near Newcastle's coal terminals and rail corridor in 2013 suggests that Newcastle residents may be exposed to higher levels of particle pollution than government monitoring stations indicate.[72]

In 2012/13, coal mining and electricity generation in the Hunter Valley produced 96,028 tonnes of PM10 (with the whole of NSW producing 113,300 tonnes).

This is over 29 times the amount produced from motor vehicles in NSW in the same year (3,300 tonnes), and over four times PM10 arising from burning (including bushfires, fuel reduction burns and domestic fuel consumption - 22,200 tonnes); almost 120 times greater than PM10 emissions from farming (810 tonnes from sheep, beef cattle and grain farming); and 4.5 times greater than PM10 produced from metal ore mining in NSW (21,000 tonnes).[73]



Health effects of particulates

Both the varied size of air particulates and their total number are implicated in affecting human health.

Figure 4. Particulate size relative to a human hair

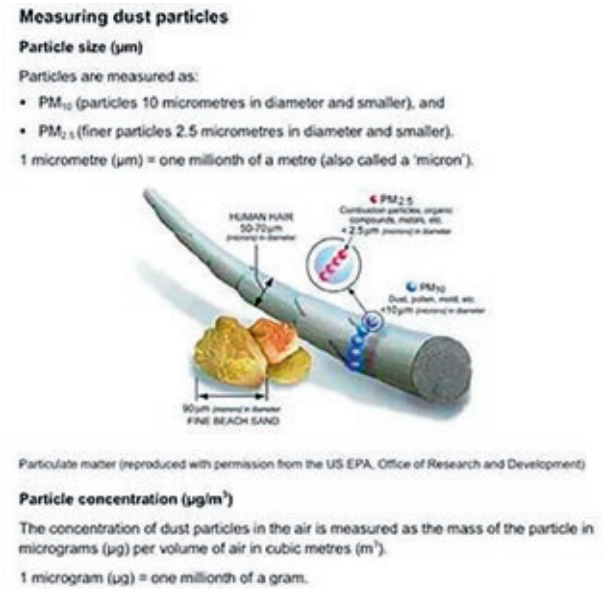


Image: Upper Hunter Air Quality Monitoring Annual Report

As a major component of outdoor air pollution, particulates can trigger heart attacks and strokes, and particulate matter has been deemed carcinogenic by the World Health Organisation's International Agency for Research on Cancer.[74]

In 2013, the World Health Organisation stated:

> "There is no evidence of a safe level of exposure (to PM10 or PM2.5) or a threshold below which no adverse health effects occur."[75]

Health risks are associated with both short and long-term exposure to particulates. Over a long period, even relatively modest increases in the levels of PM2.5 can significantly increase the risk of premature death.

Due to their very small size, PM2.5 (along with other toxins which attach to it, including heavy metals) can travel deep into the lungs and pass into the blood stream, where they can trigger cardiovascular events, such as heart attacks and strokes.[76] They stimulate chronic inflammation, may contribute to asthma incidence and severity and may cause direct tissue damage due to heavy metals and other toxins adhered to their surface.

Exposure over long periods to increased levels of PM2.5 is associated with serious health impacts: an increase of 10 $\mu g/m^3$ is associated with a 4 per cent increase in deaths from all causes, a 6 per cent increase in cardiopulmonary deaths, and an 8 per cent increase in deaths from lung cancer.[77]

Short term exposure is harmful too: exposure to a 10 $\mu g/m^3$ rise in PM2.5 can increase daily mortality by 1 per cent and increase hospital and emergency room visits for cardiovascular illness by more than 3 per cent and for respiratory illness by 4 per cent.[78]

These associations have been demonstrated in areas with mean 24 hour PM2.5 concentrations as low as between 6.1 and 22 $\mu g/m^3$ [79] – levels that are frequently exceeded in the Hunter Valley.[80]

The dispersal of PM2.5 is of particular concern given its propensity to be airborne for longer than other heavier particles, leading to wider distribution, and given the strong links with a range of diseases and mortality.[81]

Short-term exposure to larger particles (PM10) can trigger adverse health responses leading to hospital admissions.[82] A recent Australian study found an increase of 10 $\mu g/m^3$ [83] in PM10 was associated with a 1 per cent rise in hospital admissions for respiratory disease.[84]

Longer term PM10 exposure was associated with the development of lung cancer in a recent large European study, which supports earlier studies and suggests particulate matter in ambient air pollution contributes to the development of lung cancer even at levels below current European air quality standards.[85]

Particulate matter is thought to be the most important component of diesel engine exhaust, which was recently classified as a human carcinogen by the International Agency for Research on Cancer.[86,87]

Health effects of other air pollutants

While particulates are a key pollutant associated with both coal mining, combustion, and transportation, other air pollutants produced in the process of mining and/or burning coal such as sulphur dioxide, oxides of nitrogen, carbon monoxide, hydrochloric acid, volatile organic compounds and polyaromatic hydrocarbons are also associated with adverse health impacts.

Substances present in vehicle emissions are also harmful to health. Diesel emissions are particularly toxic as they emit fine particulate matter (PM2.5) containing polycyclic aromatic hydrocarbons (PAHs), a known carcinogen.[88] Diesel emissions also include volatile organic compounds which can, in the presence of sunlight, combine to form ground level ozone which is harmful to respiratory and cardiovascular systems.[89]

The table below shows the volume in tonnes of these pollutants produced by coal sources in the Hunter Valley as reported to the National Pollutant Inventory in 2012–13.

Figure 5. Air emissions from Hunter Valley coal sources (tonnes) 2012–13[90]

Air pollutant	Coal-fired power stations	Coal mines and coal terminals	Total
PM10	1,673	94,196	95,868
PM2.5	894	2,241	3,136
Sulphur dioxide	134,176	49	134,225
Oxides of nitrogen	91,266	28,419	119,685
Volatile organic carbons	566	1,751	2,317
Carbon monoxide	4,702	17,358	22,061

*See Figure 7 below for an overview of health impacts associated with each of these pollutants.

Communities at risk from poor air quality

The communities most affected by open cut coal mining and coal-fired power generation in the Upper Hunter region and most at risk from poor air quality are the larger regional towns of Singleton and Muswellbrook,[91] and the smaller towns of Camberwell, Warkworth, Maison Dieu, Jerrys Plains and Wybong.[92]

In the Lower Hunter, air quality concerns have been in relation to the two coal-fired power stations on southern Lake Macquarie,[93] and more recently in relation to expanding coal exports and the associated increase in coal trains through the city of Newcastle to the port.[94]

The recent and rapid expansion of the industry has led to considerable and increasing concern about the impacts of coal on the health of the local population, particularly among vulnerable groups.[95,96,97,98]

The people most at risk of exposure to and health effects from poor air quality are: babies and children, elderly people, Indigenous people, those with chronic ill health, low socio-economic status, or with pre-existing cardiovascular and respiratory disease.[99]

A New South Wales Health Report from 2010 reported that the Hunter regions most affected by open cut coal mining and coal-fired power generation have higher rates of emergency visits and hospital admissions for asthma and respiratory disease and cardiovascular disease compared with the rest of the state.[100]

An earlier study (1990s) found self reported asthma was more common among children living in a town near two coal fired power stations compared with another similar control town,[101] and a more recent survey (2010) found the Hunter region had the highest proportion of children diagnosed with asthma in the state.[102]

While there has been an increase in air quality monitoring in response to community concerns in recent years, there has been no comprehensive epidemiological or toxicological studies of the health impacts of the long term effects of coal on the Hunter Valley community to date.

Health effects from blasting

The use of explosives in coal mines to uncover deep coal seams produces dust and particulates as well as toxic gases which contribute to air pollution, such as nitrogen dioxide (NO^2), nitric oxide (NO) and carbon monoxide (CO).

The most toxic of these, nitrogen dioxide, creates orange/brown plumes and a pungent odour, such as occurred in Muswellbrook following an explosive blast at BHP Billiton's Mount Arthur Mine in February 2014.

Exposure to nitrogen dioxide at low levels can cause irritation of eyes, nose and throat, dizziness and headache, shortness of breath and wheezing, and can worsen asthma.[103]

At high levels, nitrogen dioxide can cause pulmonary oedema (inflammation of the lungs) which can be fatal.

Current World Health Organisation guidelines for NOx (the generic term for nitric oxide and nitrogen dioxide) are a one-hour level of 200 μg m3 (approximately 200 parts per billion) and an annual average of 40 μg m3.[104]

The concentrations of these gases considered Immediately Dangerous to Life or Health (IDLH) for NO_2, NO, and CO are 20, 100, and 1,200 parts per million (ppm), respectively.[105]

However, typical concentrations of NOx in post-blast clouds can measure anywhere between 5.6 to 580 ppm, exceeding the safe limits by around 30 to 3,000 times.[106]

The most recent scientific study on blast fumes in the Hunter Valley was published in 2007. It suggests many blasting events lead to levels of dangerous gases within the blast exclusion zone that are "many times higher" than occupational exposure standards, while exposure levels of communities downwind from the blast were unknown.[107]

Two miners were hospitalised and five mine staff treated for exposure to toxic fumes following a blast at the Mount Thorley Warkworth mine in the Hunter Valley in September 2013.[108] In February 2014, a blast at the Mount Arthur mine in the Upper Hunter turned the sky bright orange when an explosive mixture of ammonium nitrate and fuel oil was detonated at the mine. The resulting blast plume containing nitrogen dioxide spread several kilometres from the site, causing respiratory irritation among nearby residents.[109,110]

Local communities are concerned about the cumulative impact of the noise and dust associated with blasting. In the absence of publicly available information on the frequency of blasting from the region's regulatory authorities, Camberwell resident Deirdre Olofsson undertook her own analysis in 2013, reviewing the Annual Environmental Management reports of 15 mines in the Upper Hunter from the previous year. This revealed 2,490 blasts occurred at 15 open cut mines – 425 at Coal and Allied's Mount Thorley Warkworth mine and 347 at the same company's Hunter Valley Operations mine.[111]

Figure 6. Blast plume Mount Arthur Mine, February 2014

Image supplied

Figure 7. Air emissions and health effects

Air pollutant	Abbreviation	Health effect	Sources
Particulate matter	PM2.5 and PM10	Recent epidemiological research suggests that there is no threshold at which health effects do not occur. Associated with respiratory and cardiovascular disease, and cancer.[1,2] Health effects may be influenced by the duration of exposure.[3]	Vehicle exhaust, including diesel trucks and trains; woodsmoke; coal dust; coal combustion; bushfires.
Sulphur oxides	SOx	Repeated or prolonged exposure may cause inflammation of the respiratory tract, wheezing and lung damage. Those with impaired heart or lung function and asthmatics are at increased risk.[4]	Combustion of coal and other fossil fuels, including vehicle exhaust.
Oxides of nitrogen/ nitrogen dioxide	NOx	Can irritate eyes, nose, throat and lungs, cause coughing, shortness of breath, tiredness and nausea. High levels of oxides of nitrogen can cause swelling of tissues in upper respiratory tract, reduced oxygenation of tissues, and maybe even death.[5]	Combustion of coal and other fossil fuels, including vehicle exhaust; burning of wood for domestic heating; bushfires.
Carbon monoxide	CO	Inhalation of low levels of carbon monoxide (200 parts per million (ppm) for 2-3 hours) can cause headache, dizziness, and fatigue. Exposure to higher concentrations (400 ppm) can cause loss of consciousness and death.[6]	Coal mining; coal combustion; fuel burning for heating; vehicle exhaust.
Polyaromatic hydrocarbons	PaHs	Exposure can cause respiratory symptoms. Considered a probable carcinogen (that is, causes cancer) by The International Agency for Research on Cancer.[7]	Emitted to air during combustion of coal, and other fossil fuels; vehicle exhaust.
Volatile organic compounds	VOCs	Can cause irritation to the eyes, nose and throat; headaches; and damage to the liver, kidney and central nervous system. Can cause cancer in humans.[8]	Industrial processes; vehicle exhaust; fuel tanks.

1 Brunkreef B and Forsberg B, 2005, Epidemiological evidence of effects of coarse airborne particles on health, European Respiratory Journal, 26, pp.309-318.

2 Brook RD et al, 2010, "Particulate matter – air pollution and cardiovascular disease: an update to the scientific statement from the American Heart Association, on behalf of the American Heart Association Council on Epidemiology and Prevention, Council on the Kidney in Cardiovascular Disease, and Council on Nutrition, Physical Activity and Metabolism, Circulation, 121:2331–2378.

3 National Pollutant Inventory, Substances, Fact sheets, Particulate matter (PM10 and PM2.5), available at http://www.npi.gov.au/resource/particulate-matter-PM10-and-pm25

4 National Pollutant Inventory, Substances, Fact sheet, Sulphur Dioxide, available at http://www.npi.gov.au/resource/sulphur-dioxide

5 National Pollutant Inventory, Substances, Fact sheets, Oxides of Nitrogen, available athttp://www.npi.gov.au/resource/oxides-nitrogen-0

6 National Pollutant Inventory, Substances, Fact sheets, Carbon Monoxide, available at:http://www.npi.gov.au/resource/carbon-monoxide-0

7 National Pollutant Inventory, Substances, Fact sheets, polycyclic-aromatic-hydrocarbons, available at http://www.npi.gov.au/resource/polycyclic-aromatic-hydrocarbons

8 National Pollutant Inventory, Substances, Fact sheets, Total Volatile Organic Compounds, available at: http://www.npi.gov.au/resource/total-volatile-organic-compounds

Figure 8. Increase in emissions from Hunter Valley coal mines (tonnes) compared with 2008/09[113]

Air pollutant	2008–09	2012–13	% increase
PM10	52,595	93,845	78%
PM2.5	1,745	2,241	28%
Oxides of nitrogen	20,088	28,417	41%
VOCs	1,428	1,751	23%
CO	11,976	17,351	45%

4.1.2 Noise pollution

As well as being an occupational hazard for miners,[114] the noise and light from mining operations (many of them 24-hour operations) can disrupt lives and interfere with the sleep of people living in communities close to mines. The health impacts of noise are not addressed in the current assessment framework used to determine whether mine proposals are approved.

Mining activities such as blasting, drilling and digging, coal loading, the operations of excavators, trucks, conveyor belts and other machinery all contribute to elevated levels of environmental noise. Alongside other impacts such as loss of visual amenity, and social disruption (see next section), noise can lead to a stress response that can adversely affect people's health and sense of wellbeing and impair quality of life.[115]

The recommended maximum for industrial noise in New South Wales is 75 decibels,[116] however many coal mines are allowed higher limits which vary according to their licence conditions. For some mines, this is as high as 120 decibels.

Particularly given the expectation of quiet surroundings in a rural environment, the application of an industrial noise policy in the region is inappropriate. Explosions at some sites such as Integra's Camberwell mine exceed 120 decibels. Local people complain regularly about noise at Rio Tinto's Mount Thorley Warkworth mine near Bulga, where noise regularly exceeds the limit by more than five decibels.[117] This mine attracted 800 noise complaints in 2012 [118] but has not led to any change in the mine licence conditions. Given plans to significantly expand this mine, locals are very concerned about the impact of noise on the physical and mental health of the community.

Bulga resident John Krey says the noise from the nearby mines at Mount Thorley and Warkworth is "extremely disruptive".

> "It makes sitting outside impossible, with noise akin to an airplane continuously overhead. Blasting from the mine shakes the house, and the noise of machinery at the mine, which works 24 hours a day, is loud enough to wake us up at night."

*See the Bulga case study p.42 for more information.

4.1.3 Water pollution

Water security and water quality is fundamentally important to human health, given our reliance on water for drinking, cooking, bathing, as well as for irrigation, watering stock, fishing and recreation.

Coal mining and combustion in the Hunter Valley pose threats to both water security and water quality.

Coal mines and power generators are big water users: mines use water to wash coal and generators use it for cooling. Two of the biggest power stations in the Hunter – Bayswater and Liddell – use more than 60 gigalitres of fresh water each year.[119] Access to water is a contentious issue for farmers in the Hunter region, where water shortages during drought have prompted criticism that "such a precious commodity as water" is used to wash coal for export.[120] Water contamination can occur when 'slurry' (coal mine waste) leaches into groundwater and underground waterways.[121]

Local Denman farmer Grantley Blake says he grew up swimming in the Hunter River, but that the pollution from the coal industry has damaged it beyond recognition:

> "The Hunter River is dead. We used to drink that water when I was a kid. Now it's full of salt, and it's black. That's got to come from the mines."[122]

Many coal facilities in New South Wales are issued with 'licences to pollute', which allow them to discharge wastewater contaminated with salt and heavy metals into surrounding waterways.[123] Underground coal mining in the state has been linked to subsidence of surface soil, water contamination and structural damage to creek beds,[124] and discharges of contaminated water and toxic waste have left previously pristine waterways devoid of biodiversity.[125]

Pollutants from coal mining dispersed by air also contribute to water pollution,[126] as does the routine discharge of wastewater – the composition of which can cause harm to downstream aquatic ecosystems.[127]

Abandoned mines can leach toxic pollution for decades, posing a significant environmental health threat.[128] The Xstrata mine, the Great Greta Colliery, ceased operations in 1999 after 50 years but in 2012 began leaking highly saline contaminated water into Eui Creek and then into the Hunter River.[129]

Further water quality risks are posed by extreme weather events, exacerbated by climate change. Increased intensity of precipitation may lead to flooding of coal mines as occurred in 2011 in Queensland, when around 20 mines were heavily flooded, and contaminated water, thought to contain heavy metals and toxic chemicals, was discharged into local rivers.[130]

Recent changes to the rules governing water use will exempt coal mines in the Hunter from rules to protect the groundwater systems and rivers from 2015, particularly during periods of drought.[131] This is a serious risk, given threats to water availability under predicted climate change scenarios.

A further risk is posed by the massive 'voids' that will be left by open cut mines in the land once all the coal is mined. As these voids are rarely filled in, the open pits (some of them hundreds of metres deep and kilometers long) become bodies of water or 'pit lakes' with poor water quality that is highly saline, and which becomes more saline over time as evaporation concentrates the already salty groundwater exposed through the coal seams.[132]

A 2005 New South Wales Department of Planning report predicted operations at that time would leave 1,272 hectares of final voids across the Hunter Valley landscape.[133]

Due to their large size, it is likely many final voids from coal mines in the Hunter Valley will become 'net sinks' for groundwater, ie they will continue drawing water from surrounding aquifers, affecting local groundwater supply and turning the pit lake progressively saline.[134] Researchers warn this phenomenon may impact on the Hunter River by reducing its annual flow.[135]

Pumping polluted water from coal mine, Bowen Basin Qld. Photo: Dean Sewell

4.2 Stress – mental, physical and social

The health impacts from coal are not just physical. Coal mining and production are also associated with serious mental health impacts. The expansion of coal mining into farming regions is causing severe psychological distress among a constituency already facing serious mental health burdens.[136] Many farmers and other people in rural communities have strong emotional connections to their land, and place great value on the physical environment as well as the social values of their rural lifestyle and community.[137] Changes to the landscape associated with mining, and contests over land, can lead to depression, anxiety and psychological stress.[138,139,140, 141,142]

Local communities in the Hunter Valley are worried about declining air quality and have been for over a decade. Air pollution was the most frequently named environmental health concern in a 2003 study;[143] while a 2014 survey found a majority of Hunter residents think coal mining is having a negative effect on air quality in the region.[144] Over 80 per cent do not want to see the industry expand and 41 per cent would like to see it contract or be phased out.[145]

In Newcastle, communities are concerned about the proposal to expand coal exports: the proposed establishment of a fourth coal terminal was opposed by 77 per cent of residents in a 2012 community survey.[146]

A recent review of the social harms associated with mining in the Hunter region found multiple examples of social injustice and revealed significant community concerns that government authorities are failing to act in the community's interests.[147]

Community concerns include:

- anxiety about the health impacts of mining
- feelings of loss and disempowerment associated with the information 'asymmetry' between the community and government/industry
- social divisions due to inequitable compensation and unequal wages in the community
- distress in relation to environmental harm and the negative impacts of coal mining and combustion on future generations.[148]

In some circumstances, whole villages are 'acquired' by mines unable to meet air quality requirements – as is proposed in the village of Camberwell (see case study below). This disrupts the social fabric of communities and can lead to serious psychological and emotional consequences for those affected.[149]

Many people seeking to oppose or limit challenging mining projects that they fear will destroy their landscape, ecological values and community describe a sense of shock and frustration when their concerns are ignored and the likely impacts downplayed by both mining companies and government agencies.[150]

Local resident Wayne Blake says he is convinced that the government is on the side of miners, not the community:

> "The community is sick and tired of the government not telling the truth, and failing to act in the community interest. It is not a level playing field for the community against mining companies and the government."[151]

Given heightened concerns regarding the adverse health and environmental consequences associated with existing mines and power stations, proposals for new projects cause considerable anxiety and alarm within communities with regard to risks to future health and wellbeing and the loss of their valuable rural amenity, with attendant risks to air, soil and water.

Projects that promise economic benefits to the community, whether real or imagined, but also bring health and environment risks can also create social division among community members. Such a loss of social cohesion over proposed mining projects can harm both individual and community health.

Communities experience multiple sources of stress, including:

- long periods of uncertainty about the impact of the project
- distress at the disruption to generational succession plans
- a sense of powerlessness about their inability to intervene in the process
- anxiety about a negative economic impact on land values
- the fear of loss – of the landscape, friendships, social networks, and of the land itself.[152]

The sense of powerlessness reported within local communities stems from the unequal power balance between coal-affected communities and mining companies. Mining companies possess far more political and institutional power; have superior resources and capacity; and greater control over natural and financial resources than local coal affected communities.[153]

The failure of positive economic benefits from coal mining to flow to local communities leads to further negative impacts. The expansion of mining occurs at the expense of other industries. This compromises the economic and cultural capital provided by other industries to communities and can diminish their economic resilience, create labour shortages in other sectors, and threaten their sustainability.[154]

The sense of hopelessness described by communities unable to influence the outcome of mining proposals can contribute to depression.[155] In rural communities, where many people are already at risk of poor mental health from a variety of stressors, proposing a coal mine can have a strong negative psychological impact.[156]

Health experts in the Hunter Valley say the issue of 'environmental injustice' affects many communities in relation to regional coal projects; that is, those who face the greatest harm from a project's social and environmental impacts have the least say in whether or not it will proceed.[157]

Laying explosives at Moolarben. Photo: Max Phillips

4.3 Work health and safety

Coal mining, whether it is underground or open cut, is inherently a dangerous occupation.[158] Underground miners face risks of falling rocks, injuries from machinery, exposure to silica and coal dust, toxic fumes and explosions and, in some parts of the world, occupational heat stress.[159]

Open cut coal mining, the main form of mining in the Hunter Valley, also poses risks from machinery, falls and rocks. Heat stress is also a factor, and is likely to increase from ongoing climate change.[160] Exposure to toxic fumes from blasts is a very real risk.

Occupational exposure to loud noise carries serious risks for miners, with prolonged exposure carrying the risk of permanent damage and hearing loss.[161,162]

While Australia has strong work health and safety laws, deaths in the mining industry are still one of the nation's leading causes of occupational deaths.[163] There has been a disturbing recent increase in mining deaths, with 2013 the worst Australian year on record.[164]

Mining accidents

More than 1,800 mine workers have been killed in the Hunter Valley coal mines since mining began.[165]

Two miners died in early 2014 when a wall collapsed in Chinese mining company Yancoal's Austar underground mine at Cessnock in the Hunter Valley.[166] Just months earlier, a woman was crushed to death by a coal truck at Glencore's Ravensworth open cut mine near Singleton in 2013.[167]

A truck driver was crushed to death by falling coal at the Ravensworth mine in 2009.[168] In the same year a mine worker in the Integra Coal underground mine at Glennies Creek near Singleton died when he was struck on the head by a piece of machinery.[169]

Photo: Max Phillips

4.4 Global warming

As outlined above (see Introduction), the greenhouse gas emissions produced when Hunter Valley coal is burned, whether in Australia or in the countries to which it is exported, contribute to the increasing and serious risks to health from climate change caused by global warming.

At a regional level, particular global warming risks faced by those in the Hunter region of New South Wales include rises in sea levels that may lead to very large increases in the frequency of coastal flooding, threatening cities, towns and supporting infrastructure (including ports, industrial buildings and rail lines) in low-lying coastal areas.[178] More severe droughts are predicted as well as more intense rainfall events that will increase the risk of severe flooding when rain does occur.[179] There will be increases in the number of very high to extreme fire danger days each year; and more frequent and intense fires will pose even higher risks to human health, property and infrastructure.[180]

Increasing heat stress from more severe and more frequent heatwaves that are anticipated will put already vulnerable people at greater risks of heat-related illnesses and deaths.[181]

People with kidney and heart diseases, as well as children, and those who are elderly, work in heat-exposed jobs or have low incomes, are all at greater risk from heat extremes.[182] Those working in outdoor settings in the region's agriculture, viticulture, tourism, and mining industries will be particularly vulnerable.

As well as threatening human health, rising temperatures associated with climate change are likely to adversely affect other species in the region.[183] Many rare and threatened species, particularly those with small geographical ranges, will be particularly vulnerable to additional stresses from climate change, such as high temperature extremes, increased and more intense bushfires and changes to rainfall patterns.[184]

Increased risks of bushfires during extreme weather events

The recent fire at the Hazelwood coal mine near the Latrobe Valley town of Morwell in Victoria highlighted the serious risks posed to communities living in proximity to open cut coal mines, particularly in the context of heightened bushfire threats from climate change.[170,171]

Plumes of smoke from the burning coal in an abandoned mine pit exposed people in Morwell to extremely high concentrations of particulates and elevated levels of carbon monoxide over a period of several weeks as firefighters and emergency service fought to bring the fire under control.[172] Thousands of local residents were advised to leave,[173] and several firefighters were admitted to hospital with carbon monoxide poisoning.[174]

An Inquiry into the coal mine fire found the event constituted a serious public health emergency and a major complex fire emergency.[175] Many Morwell citizens and other residents of the Latrobe Valley experienced adverse health effects and may be affected for an indeterminate period into the future.[176]

The Inquiry has recommended that a health study of the affected community continue for at least 20 years "given the long lead times of some potential pollutants" and the exposure of young children to pollution from the fire. The impacts of the Hazelwood coal mine fire have been estimated to cost over $100 million.[177]

Hazelwood coal mine fire, Feb 2014. Photo: Chris Morley, used with permission.

5. The economics of health and environmental damage from coal

The annual economic costs of the harm caused by mining in the United States have been estimated in one study to be US$345 billion.[185] Another study suggests the costs of coal are greater than the value of the industry to the US economy.[186]

The same question ought to be investigated here: is coal costing Australia more than the industry is worth? Assessments of some coal projects in NSW suggest this may well be the case.[187]

An economic assessment of six coal projects in New South Wales found the economic and employment benefits of proposed projects are frequently overstated by the industry project proponents, while the environmental costs and greenhouse gas emissions are downplayed. The adverse economic effect on other industries (caused by high mining wages) is also downplayed, and the health costs ignored.[188]

This assessment suggests that while the industry accrues profits from these projects, New South Wales taxpayers may ultimately bear a cost that exceeds their value from unaccounted for damages to health, biodiversity and the climate.[189]

5.1 Royalties and subsidies

Any perceived economic benefits of the industry must be weighed against the subsidies provided by taxpayers to support the profitability of the industry, the damages it causes through harm to health and natural capital, the costs of climate change, and the lost opportunities from the failure to develop other industries, like clean renewable energy.[190]

Hunter Valley coal delivers profits to international mining companies and mining royalty payments to the New South Wales government ($1.3 billion in 2012–13).[191] The industry claims these royalties are vital to the delivery of essential services in New South Wales,[192] but they only account for around 2 per cent of state government revenue.[193]

Given the bulk of coal mines in the Hunter Valley are foreign owned, the profits from the industry do not end up in the region, but overseas.[194]

Substantial subsidies are provided to the mining industry despite its legacy of harm and risks to health. For example, mining companies are exempt from a federal tax on diesel, amounting to a subsidy of around $2 billion each year. Nationally, government support for coal-fired electricity was $3.6 billion in 2012–13, compared to $1.4 billion for renewable energy.[195]

The New South Wales government has provided $873 million in subsidies for the minerals and fossil fuel industries from 2008–2014.[196]

Additional public support for the industry has been the provision of coal from the state-owned Cobbora coal mine to state owned electricity generators at one-third of the price generated from exports.[197] Coupled with other subsidies, this means the people of New South Wales are effectively subsidising an industry that causes significant harm to their natural capital, adds millions of dollars to health costs, and limits their opportunities to diversify their economy and invest in other industries for a stable economic future.[198]

While the externalities are hard to evaluate, there are dangers in failing to do so, as academics Linda Connor and Stuart Rosewarne wrote in 2012:

"The costs to the natural environment and farming land are hard to estimate in dollar values. While the NSW Minerals Council says "coalmining is a temporary use of land," in fact, coalmining leaves large tracts of sterile landscape, punctuated by former open-cut voids filled with toxic fluid. Creek beds and aquifers are punctured and cracked. Contaminated mine water is released into river systems, which adds to salinity and harms native species.

The expansion of mining threatens rural enterprises such as agriculture, viticulture and horse breeding, and the communities these industries sustain."[199,200]

Mining industry lobbyists are inclined to overstate the value of the industry to the state, as well as the number of jobs it creates, frequently claiming jobs created as part of the industry's interaction with the wider economy, rather than those directly employed in mining.[202] The higher wages paid in the mining sector attracts workers away from other jobs and is creating acute skills shortages in manufacturing and other sectors.[203]

Industry profiles rarely acknowledge the adverse economic impacts of the mining sector on other sectors, such as agriculture and tourism, which have been negatively impacted by the high Australian dollar – driven by rapid growth in resource exports.[204,205]

Those people directly employed in mining in New South Wales represent just 1.4 per cent of a 3.5 million workforce;[206] the 13,000 people working in mining in the Hunter make up just 5 per cent of the region's workforce.[207]

Image: Conor Ashleigh [201]

5.2 Unaccounted health and environment costs

There are many costs associated with the coal industry that are not reflected in coal's price, nor in the price of electricity produced from coal, and are considered 'external' to production and consumption decisions.[208] However this means industry profits are occurring at the expense of health and wellbeing for local communities, while damaging valuable natural capital and contributing to climate damage.

The full cost to taxpayers of pollution from mining, transporting and burning coal in the Hunter Valley, or indeed Australia, is unknown.[209]

However the significant health impacts of air pollution provide some insight into total costs.[210]

In 2009, the health costs of air pollution associated with coal combustion in Australia were estimated to amount to $2.6 billion annually, based on a health damage estimate of $13/MWh.[211]

In 2012–13, the five power stations in the Hunter Valley (Eraring, Bayswater, Liddell, Vales Point and Redbank) generated approximately 43 terawatt hours (TWh) of electricity.[212]

Using the estimate above, the health damages associated with coal-fired power in the Hunter Valley in 2012–13 are around $600 million annually.

The available economic analysis of health costs associated with air pollution in the Hunter region are limited to two studies: one associated with the costs of exposure to large particle pollution (PM10) in the Newcastle region[213] and another that estimates the costs associated with exposure to fine particle pollution (PM2.5) for 'significant urban areas' – which in the Hunter Valley include Muswellbrook and Singleton.[214]

In the more heavily populated areas of Newcastle, the annual health costs per tonne of PM10 have been estimated to be $63,000 (2003 Australian dollar (AUD) values) – amounting to a total of $1.76 million (2003 AUD) in 2005.[215]

Using this analysis and more recent studies of health costs associated with PM2.5, estimates of current health costs associated with particle pollution in two regions of the Hunter are provided in the boxes below.

As outlined earlier, exposure to PM2.5 is associated with potentially greater health risks than larger particles.

A 2013 study by economic consultants Pae Holmes estimates the economic damages to health from each tonne of PM2.5 in the Singleton area as $36,000.[216] The same study suggests the costs in the larger and less populated Muswellbrook area as $13,000 per tonne.

The five power stations together with operating coal mines in the Hunter Valley produced 96,028 tonnes of PM10 and 3,428 tonnes of PM2.5 in 2012–13.[212]

Health costs associated with PM2.5

In 2012–13, the National Pollutant Inventory reported that coal sources in the Singleton area produced 1,300 tonnes of PM2.5 (from 11 coal mines) and 5 tonnes of PM2.5 from the Redbank Power Station.

In the Muswellbrook area in 2012–13, 730 tonnes of PM2.5 was produced from six coal mines and 680 tonnes of PM2.5 from two coal-fired power stations (Bayswater and Liddell).

This indicates the health costs associated with PM2.5 emissions in the Singleton and Muswellbrook areas in 2012–13 amounted to $47 million and $18.3 million respectively – a total cost of $65.3 million.

*These estimates do not reflect the total PM2.5 emissions in the area, i.e. from other sources, nor the dispersal of particulates into other LGAs so actual health damage costs may be higher, or lower, depending on exposure.

HEALTH COSTS ASSOCIATED WITH PM2.5

SINGLETON AREA

1,305
TONNES OF PM2.5
FROM COAL SOURCES IN SINGLETON.
COST $36,000/TONNE HEALTH DAMAGES

MUSWELLBROOK AREA

1,410
TONNES OF PM2.5
FROM COAL SOURCES IN LESS POPULATED MUSWELLBROOK.
COST $13,000/TONNE HEALTH DAMAGES

THE COST ON HEALTH

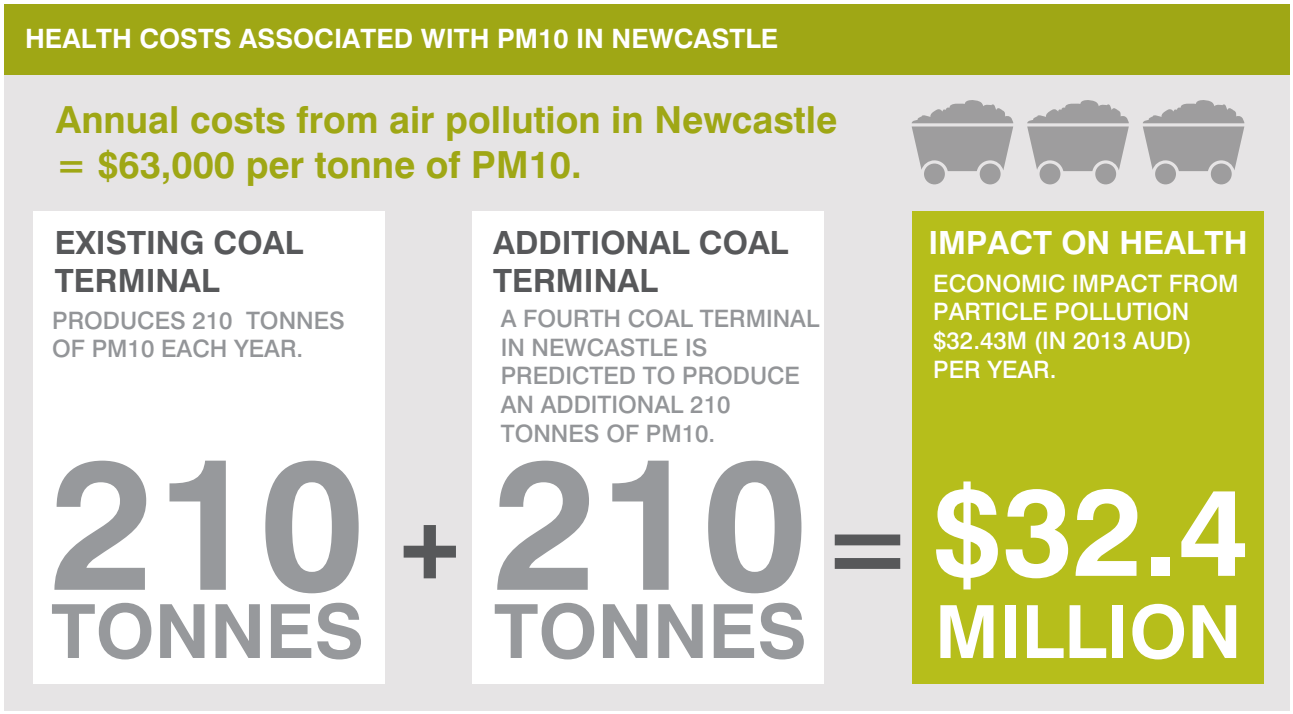
$65.3 MILLION

Health costs associated with PM10 in Newcastle

A 2005 study suggested the annual costs associated with adverse health impacts from air pollution in Newcastle amounted to $63,000 per tonne of PM10.

The existing coal terminal at Kooragang Island at Newcastle (known as T3) has capacity to handle 120Mtpa and produces 210 tonnes of PM10 each year.[218]

A fourth coal terminal in Newcastle is predicted to add 70Mtpa capacity, with a master plan to expand capacity to 120Mtpa,[219] potentially producing an additional 210 tonnes of PM10.[220] Using this assessment of costs, the current economic impact from the particle pollution from the existing coal terminal on the health of the Newcastle community is around $13 million per year. The additional terminal may double this to $26 million (in 2005 AUD) or $32.43m (in 2013 AUD) per year.



5.3 Economic costs of global warming

Given the threat to Australia and the world from global warming, the high carbon intensity of coal projects should be a key factor in energy and resources policy decision-making.

In addition to the adverse economic impacts associated with the 'externalities' of mining and burning coal on state budgets, the global economic damage from its contribution to climate change must also be considered.

These damages include health and property damage, impacts on agriculture, damage to ecosystem services, and other welfare costs associated with climate change.[221]

The method of establishing this cost is known as the 'social cost of carbon' – essentially a monetised estimate of the damages caused by emitting an additional tonne of carbon dioxide in one year.[222] Estimates of the social costs of carbon vary widely.

Using a range of estimates from the literature, current coal production in the Hunter Valley is estimated to be contributing to a global social cost of carbon of between $16 and $66 billion per annum.

Social cost of Hunter Valley carbon emissions

Evaluations of the social costs of carbon are highly variable and range from $37/tonne of carbon dioxide emitted to $190/tonne. Using figures from this range, it is estimated that the social cost of carbon associated with the carbon emissions (348Mt) from current production levels of Hunter Valley coal (145Mtpa) range from $16 billion to $66 billion annually.

The social cost of carbon associated with estimated emissions (583Mtpa) from projected productions of Hunter Valley coal in 2022 (243Mtpa) is predicted to increase to a range from $26 billion to $111 billion annually.

Reference	Annual social cost of carbon	Annual Social Cost of Carbon in $AUD per tonne of CO_2e, 2013 dollars	Annual Social cost of Carbon from 2013 coal production in Hunter Valley (AUD$ 2013)	Annual Social cost of Carbon from 2022 coal production in Hunter Valley (AUD$ 2013)
US Government (2013, Table 2) [Reference 1]	$USD37 (US$/tonne CO_2 emitted, 2007 dollars	$44.74	$16 billion	$26 billion
Tol (2013, Table 2) [See Reference 2]	$USD135, per tonne of C or $US37 per tonne of CO_2e 2010 dollars	$42.29	$15 billion	$25 billion
Anthoff (2009) [See Reference 3]	$USD206 per tonne of C or $US56 per tonne of CO_2e in 2008 dollars	$65.36	$23 billion	$38 billion
Stern 2008 as reported in Anthoff, 2009 [See Reference 3]	$USD300 per tonne of C or $US82 per tonne of CO_2e in 2008 dollars	$95.19	$33 billion	$56 billion
Stern 2008 adjusted to reflect "doubling of risk" [See Reference 4]	$USD600 per tonne of C or $USD163.49 per tonne of CO_2e in 2008 dollars	$190.38	$66 billion	$111 billion

1. Interagency Working Group on Social Cost of Carbon, 2013, Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis, United States Government, available at http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf
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3. Anthoff D et al, 2009, "Risk aversion, time preference, and the social cost of carbon," Environmental Research Letters, 4, available at http://iopscience.iop.org/1748-9326/4/2/024002/pdf/1748-9326_4_2_024002.pdf
4. Stewart, H. & Elliot, L. 2013, 'Nicholas Stern: 'I got it wrong on climate change – it's far, far worse'", The Observer, 27 January. Available at: http://www.theguardian.com/environment/2013/jan/27/nicholas-stern-climate-change-davos

6. Inadequate regulation with a bias towards approvals

While there is a substantial body of evidence and growing community concern regarding the adverse impacts on human health from coal in the Hunter region, this has had little effect on the approval rate of new mining projects.[223] Despite concerns raised by researchers, health organisations, the New South Wales Department of Health, community groups, and individual medical practitioners, little has been done through stronger regulations or changes to planning laws to protect health and wellbeing.[224]

The views of health experts and community members appear to have little impact on planning policy decisions.

Even when there is strong opposition to coal projects, concerns are all too frequently ignored and decisions made in the interests of mining companies.[225,226]

While new mining projects are obliged to evaluate the cumulative impacts of many mines operating together, these frequently assess a narrow scope of cumulative impacts, and fail to accurately account for greenhouse emissions, human health and broader environmental impacts.

State-based regulations which require Environmental Impact Assessments for mining projects are inadequate in assessing human health impacts and are frequently non-transparent.[227]

Federal environmental laws, such as the *Environmental Protection and Biodiversity Conservation Act*, are aimed at protecting biodiversity and supporting conservation of ecosystems, not the protections of humans.

While links between human health and the environment are well understood within the public health and environmental health professions, this has not been reflected in policy decisions and is ignored in industry regulations.[228]

Current processes for the approval of coal projects in New South Wales burden, rather than protect, the community. While health impact assessments (HIAs) are well established methods for evaluating the health impacts of infrastructure projects, these are rarely employed in assessing coal project proposals by state planning decision-makers. Without an HIA, or a comprehensive assessment of environmental impacts, communities are concerned projects are being approved without an accurate assessment of the health, social or economic costs.[229]

The failure to conduct health impact assessments as part of the process of assessing applications for mining licences means projects are going ahead without an adequate assessment of the health consequences for local communities.

Where included, health impacts are either narrowly defined or ignored in planning decisions, and the removal of local government powers to influence decisions about coal mining projects limits the ability of local communities to exercise any power in opposing new projects.[230,231]

For example, the Muswellbrook Shire Council says the community is “exhausted” by the “negative consequences of the mining industry”[232] but, due to changes to planning laws, local governments now lack any power to approve or reject new coal projects.[233]

Other changes to state planning laws include the removal of the principles of Ecologically Sustainable Development (ESD), which allows economic considerations to take precedence over social and environmental concerns, and limits to the rights of communities to appeal decisions on coal and gas development, with no appeal rights at all when there has been a public hearing by the Planning Assessment Commission.[234]

Newcastle public health academics have advised that the construction of T4, the fourth coal export terminal in the city of Newcastle, will cause a critical increase in harmful coal train pollution along the rail corridor through Hunter towns and Newcastle suburbs. They assert that carcinogenic diesel exhaust combined with PM10 and PM2.5 dispersals from coal trains creates a toxic pollution source that must be mitigated at the development planning stage. However, New South Wales Planning and Environment does not require such 'upstream' impacts to be considered in the approval process for T4.[235]

The recent introduction of a 'gateway' approval process following amendments to New South Wales planning laws – ostensibly to protect agricultural land and groundwater – has failed to provide assurance to communities concerned about the evaluation of public benefit in relation to new coal projects.[236]

The first project to be considered under the 'gateway process', the Bylong Valley Coal Project in the Hunter Valley, failed to meet 12 out of 13 criteria, and will have significant impacts on productive land and local water supplies, but was still awarded a conditional certificate and has progressed to the next stage of planning development.[237]

Other community concerns about the approvals process involves the practice of contracting out environmental assessments for projects (which evaluate impacts on air, soil and water quality, as well as on social, economic, cultural, and heritage values) to private consultants who frequently also work for the coal industry.

This practice has led to considerable distrust of the findings of experts employed by industry that show proposed coal projects will not cause adverse impacts or that the source of pollution causing concern is not from the coal industry.[238]

This has the effect of further undermining community confidence in the industry and in the responsibility of regulatory and government agencies to act in the community interests, and adds to the mental health burden of communities due to a sense of distress and abandonment.[239]

7. Conclusion

The impacts of coal in the Hunter Valley on the health and wellbeing of communities and the environmental foundations on which health depends (clean air and water, fertile soil) suggest the costs of the industry to society are considerable.

Coupled with the contribution of coal to global warming and the consequences for the health and wellbeing of people globally, it is clear that the expansion of coal in the region will have adverse consequences at a local, national and global level.

As a recent editorial in the *Australian and New Zealand Journal of Public Health* concluded, coal is a fuel that is "no longer fit for purpose on a crowded and overheated planet".[240]

Australia is extremely fortunate in that it has access to some of the most abundant renewable energy resources in the world. Coupled with energy efficiency initiatives, it is possible to replace coal-fired electricity generation in the Hunter Valley with cleaner, healthier alternatives – and in doing so, support the development of a new regional industry.

It is time for policy and planning decisions to be implemented that allow regions like the Hunter Valley to begin a transition to other less harmful industries that will provide a safe, healthy and economically secure future.

The people of the Hunter Valley and the natural values of the region should not be sacrificed in the interests of short term profit for an industry that is causing harm.

It is hoped this report will shed some light on some of the risks posed by coal in the Hunter Valley, assist in a public effort to influence policy decisions to minimise those risks, and provide the opportunity for the region to consider an alternative future.

Photo: 100% Renewables

Case studies

Photo © Conor Ashleigh

Newcastle

Professor Nick Higginbotham has been researching the impacts of coal on people in the Hunter for over two decades.

Nick Higginbotham is an Associate Professor at the University of Newcastle and has worked in the public health research group for 27 years. His research has involved looking at the impact of coal mining on the community and the social lives of people in the Hunter. Along with Linda Connor and Glen Albrecht, Professor Higginbotham developed the 'Environmental Distress Scale', which is now applied worldwide to evaluate people's distress and sense of loss associated with landscape transformation. In recent years, his research has shifted to investigating the health impacts associated with the expansion of coal loading in the Newcastle area.

The proposed development of a fourth coal export terminal (T4) in the city of Newcastle threatens to expose an already vulnerable population to even higher levels of particle pollution. With all three existing terminals operating at capacity, the addition of T4 could see coal exports reach 280 million tonnes per annum. The proposal is expected to increase by 50 per cent existing annual coal train transport, which would mean an almost continuous passage of coal trains, with one train around every 7 minutes. Operating at its full capacity of 120Mtpa, T4 and the associated rail transport could potentially add 363 tonnes of particle pollution to Newcastle's already polluted air.[241]

There are 25,680 people who live within 2 kilometres of the proposed facility, one-third of whom are children (under 14 years) or elderly (over 65 years). Their neighbourhoods include 24 schools, preschools and nursing homes. Household incomes in the community are lower than the state average, making it more vulnerable to health risks.

Local residents are concerned the development of the fourth terminal will have serious implications for children at school and quality of life for local residents in terms of both noise and air pollution.

Coal transport exposes people along the rail corridor to harmful and carcinogenic air pollution from the diesel fumes emitted by trains and from the coal dust dispersed as trains move along the rail corridor.

Professor Higginbotham says the increase in coal trains is adding an extra burden of air pollution around the rail corridor from both coal dust and diesel fumes.

> "Diesel powered coal trains are a major source of toxic pollution, their passage creates a plume of pollution combining cancer causing diesel exhaust with harmful particulate matter (PM10 and PM2.5).
>
> "This means we are going to see new cases of asthma, of lung disease and heart disease, and Newcastle is already well known for having a higher rate of heart disease than the rest of New South Wales."

There are currently no regulations limiting diesel emissions from coal trains or non-road vehicles.

The local New South Wales Health office, Hunter New England Local Health District, reports increasing numbers of complaints from residents about coal dust and particle pollution as well as noise pollution associated with coal handling and loading facilities.[242]

Monitors at nearby Kooragang Island already record levels of particle pollution above World Health Organisation annual air quality standards for PM10 of 20 $\mu g/m^3$; another monitor at Stockton regularly records levels that exceed National Environment Protection Measure (NEPM) particulate standards.[243]

EPA Air quality monitoring stations in communities several kilometres from the coal loading terminals show levels of air pollution that exceed the World Health Organisation standards for PM10 and the national advisory standard for PM2.5.

Professor Higginbotham and other public health experts in the region have mounted a comprehensive case against the approval of the terminal, arguing the project threatens a key determinant of health and wellbeing for the Newcastle community: clean air. They say the failure to undertake a Health Impact Assessment is "profoundly negligent", given the existing poor air quality in the region, existing poorer health of residents, and additional contributions to poor air quality that will come from trains carrying coal to the port.[244]

They also argue the project's assessment of air quality uses outdated research, proposes inadequate standards, fails to account for significant levels of rail line pollution, will likely see substantial breaches of emissions standards during extreme weather events – which are increasing in both frequency and severity[245] – and would result in air quality standards being regularly exceeded along the rail corridor.[246]

Monitoring undertaken by an alliance of concerned residents groups in Newcastle found 'hot spots' of industrial pollution in suburbs adjacent to the existing coal facilities, indicating several areas in which national air quality standards may be regularly breached.[247]

A 2013 study of particulate pollution from coal trains commissioned by the Dust and Health Committee of the Coal Terminal Action Group found coal trains increased particulate pollution, with unloaded wagons responsible for higher levels of particle pollution than loaded.[248] Monitoring undertaken by the Australian Rail Track Corporation found loaded coal trains increased particulate by 4.8 $\mu g/m^3$ for PM10 and 1.2$\mu g/m^3$ for PM2.5.[249]

However local community monitoring of particulate levels associated with loaded coal trains found spikes in both PM2.5 (thought to be from diesel emissions) and PM10 (likely to come from coal dust). The monitoring found average increases in PM10 pollution of 18.9 $\mu g/m^3$ for unloaded trains and an increase of 16.3 $\mu g/m^3$ for loaded coal trains.[250]

"We have done research ourselves with community groups and found that each additional coal train 'pass-by' is contributing to increased air pollution – in some case (there is) a doubling or even ten times the amount of pollution in the air after a train has gone by," Professor Higginbotham said.

Using the estimates of health impacts from air pollution in the Hunter in 2005,[251] Newcastle epidemiologist Dr Ben Ewald estimated the additional pollution of the proposed fourth terminal would increase health costs in the Newcastle community by $29 million each year.[252]

Also of concern is the cancer cluster found among coal loading workers at Port Waratah Coal Services at the Kooragang coal terminal in Newcastle, the proposed site of the new coal export terminal.[253]

A University of Newcastle study found Kooragang workers were 1.8 times more likely to be diagnosed with a cancer compared to the rest of the Australian population and 2.8 times more likely to be diagnosed with a cancer than workers at the Carrington coal terminal.[254] Coal operators (those most exposed to coal) were 3.3 times more likely to be diagnosed with a cancer. The study did not offer an explanation for this increase.

Photo © Conor Ashleigh

Camberwell

Farmer Wendy Bowman is one of the last remaining residents at Camberwell – and she refuses to leave.

The Ashton South East Open Cut project is a proposed new open cut coal mine near the village of Camberwell near Singleton. It would extend the existing Ashton mine site over the New England Highway and into grazing land on the banks of Glennies Creek – one of the Hunter River's most significant tributaries.

The importance of Glennies Creek for the health of the Hunter River, and in particular its importance for irrigation of the nearby Pokolbin and Broke-Fordwich wine regions, led the New South Wales Office of Water to initially oppose the new mine. However the Office suddenly and inexplicably reversed its opposition in 2012, which led to the mine being approved (despite opposition from the New South Wales Health Department).[255]

The village of Camberwell already has coal mining on three sides. If the South East Open Cut mine goes ahead, Camberwell will be surrounded by coal mines.

The bulk of the houses (87 per cent) in the village have been purchased by the mine owner, Chinese Government-owned Yancoal, in anticipation of the mine extension proceeding, leaving few original residents.

One local resident and farmer, however, refuses to sell – and the mine is not economically viable without the property.

Wendy Bowman has been a farmer in the region since 1957. She was forced off her previous farm, Ashton, by the Ravensworth South open cut coal mine when co-existence with constant dust and water pollution from the mine became untenable for Wendy and her dairy herd.

Her Droughtmaster cattle farm, Rosedale, is now in the sights of Yancoal, one of the world's biggest coal producers, as an extension to its Ashton mine. The existing mine is both open cut and underground and produces 5.2 million tonnes of coal each year.

The threat of losing another farm to an open cut mine has Mrs Bowman digging in. Despite being in her late 70s, and having being diagnosed with "dust in the lung", she says she has no intention of uprooting herself to convenience an international mining corporation and will stay to defend the land and its agricultural and ecological values.

The mine is small, relative to others in the region, and will only operate for seven years.

"Why dig up and destroy all the creek flats that will feed people for hundreds of years?" she asks.

An economic assessment of the project found the cost benefit analysis (submitted by the mine owners to the planning approval process as part of an Environmental Assessment) overstated the value of the project to New South Wales by $378 million, and to the world by $460 million.[256] There was no value assigned to ecological impacts and no consideration of health impacts.

The destruction of communities through property acquisition and attrition as people leave for a cleaner, quieter environment is one of mining's little acknowledged 'social harms'.

This social and psychological disruption is a significant health impact, and one that is, according to public health physician Dr Craig Dalton, likely to have a "far greater impact than the current particulate levels".[257]

Mrs Bowman's main concern now is not for her own health, but for that of children in the community. She cites many examples of children suffering chronic respiratory illnesses, so ill they are missing months of school each year, with many only improving when they leave the region for a holiday, where their health rapidly recovers.[258]

Wendy describes the impact of blasting from the nearby Ravensworth mine as "significant", both from the noise and the dust it leaves behind, but says it's very difficult to get the mine to take responsibility for the impact. "You ring the compliance officer at the mine, and they ask 'how do you know the dust is from this mine?'. It comes right after the blasting explosion, and yet they want you to collect samples and prove it came from their mine."

Photo © Conor Ashleigh

Denman

Grantley Blake is a farmer whose family has owned Blakefield near Denman for more than a century. The farm is bordered by Mount Arthur mine to the north, Mangoola to the west, and a proposed underground coking coal project, Spur Hill, on the southern side.

Grantley lives on the farm with his wife, a retired nurse, his two sons and their families, including seven grandchildren, the oldest of whom is eight. He is deeply concerned about the health of his family – and says the coal dust from the Mangoola coal handling facility and stockpiles just three kilometres away from the farm causes constant respiratory problems.

The children are constantly on antibiotics for ear, nose and throat problems related to poor air quality, Mr Blake says, with the youngest suffering a near fatal respiratory illness, an event the family believes to be related to fumes from blasting at the mine.

The family now purchase their drinking water and the children are only allowed to play outside when the wind blows from the south – a respite that will be lost if the Spur Hill mine goes ahead.

While he understands the proponents of the Spur Hill mine are keen to buy his property, Mr Blake refuses to talk to them, and says he's holding on for the sake of protecting "some of the best farmland in the country".

"This land has been farmed by my family for more than a century because it's the best, but once it's mined, that's gone."

The water in the adjacent Hunter River is heavily polluted by the mines, affected by waste water heavy with salt and other contaminants that the mine is allowed to discharge into the river. Along with cattle, Mr Blake farms fish, but if he puts water from the river into his fish tanks, the fish are "dead within three days".

"We used to drink that water when I was a kid. Now it's full of salt, and it's black. That's got to come from the mines."

In addition to the health burden, Mr Blake says it's the additional costs associated with mining that must be borne by local communities and families that he objects to.

"We've got to buy water. Pay more for electricity because the kids can't go outside in the summer and have to have the air con on. Buy extra filters for the fish. Pay extra health bills. These are because of mining, mining by international companies, whose profits don't even stay in this country. Why should we pay?"

Mr Blake's son Wayne is deeply concerned about the health of his own and other children and the impact of mining on the future of other industries in the Valley.

"My kids are always sick – they always have throat infections, respiratory problems, coughs and so on. They always need their [asthma] puffers, always have runny noses."

The source, according to Mr Blake, is the dust from overburden at the adjacent mine and from the coal preparation plant across the river. In his view it has been getting steadily worse for the last five years (the mine has been operating for six years).

He believes poor regulation of the industry has led to the towns of Muswellbrook, Singleton and Denman being 'over-populated' with coal mines, and that the government is on the side of miners, not the community.

"The recent events at Bentley [where community protests led to the removal of Metgasco's exploration licence to drill for coal seam gas due to insufficient community consultation] show the community is sick and tired of the government not telling the truth, and failing to act in the community interest. It is not a level playing field for the community against mining companies and the government," he said.

Mr Blake sees little regard also for the longer term, leaving him concerned about the future of the region.

"We rely on the agriculture industry to feed us, but you can't regenerate land damaged by mining to grow food."

"What happens to the Hunter Valley after mining?" he asks.

Bulga – Warkworth

The tiny town of Bulga is less than 5 kilometers away from three of the largest open cut coal mines in the Hunter Valley: Mount Thorley Warkworth (owned by Rio Tinto), the Bulga mine (Glencore-Xtrata), and Wambo (Peabody Energy).

Proposed expansions seek to extend existing mines and would bring the Mount Thorley Warkworth mine right up to the edge of the village.

If the mine extension goes ahead, it will produce 18 million tonnes of coal each year for 17 years. The total volume of coal produced over this project's lifetime will reach 306 million tonnes.

The project will see the mine expand through areas previously identified as environmental offsets for the protection of biodiversity approved for the previous project. It breaks a previous Deed of Agreement that Rio Tinto signed in 2003 not to expand the mine any further – to preserve it "in perpetuity", an agreement locals had relied on when purchasing or upgrading property.

The local community opposes the extension, citing the destruction of almost 500 hectares of endangered ecology, including habitat for threatened species, as well as radical changes to the character of the village and the landscape. The land to be cleared was set aside as a biodiversity offset when the mine was originally approved.

In 2013, represented by the New South Wales Environment Defender's Office, the Bulga Milbrodale Progress Association took their concerns to the New South Wales Land and Environment Court, seeking to overturn the government's decision to allow Rio Tinto to expand the mine.

The Court found in favour of the local community, with Judge Brian Preston ruling that the harm to the environment from impacts on endangered woodland and the community of Bulga outweighed any economic benefit of expanding the mine.[259]

The decision was upheld in the Supreme Court. Both courts agreed that the social, environmental, and economic impacts of expanding the mine were so great that they exceeded the benefits the project would bring to the state. The courts found that Rio Tinto had systematically overestimated the economic value of the project, and underestimated the impacts.

Despite the legal wins, Rio Tinto resubmitted its application again in 2014.[260] Under recent changes to New South Wales Planning Laws, the community has no right to appeal the new application and, if it is approved, the decision cannot be challenged in court.

An economic assessment of this project suggests economic benefits of the extension are overstated and that the harm to the community and environment from noise, vibration, effects of air quality, dust and loss of amenity were not accounted for.[261]

There was no estimate of the social value of the community, nor of the environmental services provided by the land.[262]

John Krey is a local resident and the former Chair of the Bulga Milbrodale Progress Association. He helped lead the legal challenge and says the community is now back to where it was four years ago.

"We've got two court cases behind us now, both of which said the mine extension shouldn't go ahead. But the New South Wales government has made new amendments to the planning laws which mean the project will be approved. Now the value of the resources is the only consideration – the impacts on the community or ecology are irrelevant. The government has removed all the impediments to getting this approved."

Mr Krey says the noise from the existing mines at Bulga is extremely disruptive for residents. It makes sitting outside impossible, due to sounds like "an airplane continuously overhead". Blasting from the mine "shakes the house".

The noise of machinery at the mine, which works 24 hours a day, wakes people at night. For people who came to Bulga to enjoy the peacefulness of the bush, the constant intrusion is upsetting and disruptive.

According to Mr Krey's monitoring, the noise levels exceed the New South Wales industrial noise policy for the two mines.

When locals are able to get the relevant government department (in this case the Department of Planning) to respond to their concerns, an offer to send a consultant to monitor noise invariably occurs during a week when the mine is quiet, he says.

It's not just the noise that is upsetting, it is knowing the noise levels are being exceeded and that no-one will enforce them.

"The mine will work to the limits of its approvals – we accept that, but when the body that is supposed to be monitoring them refuses to do so, that is not acceptable," he said.

Dust is also a problem, and like Wendy Bowman in Muswellbrook, John Krey finds it very difficult to get the mine or the authorities to accept responsibility for the dust – or respond to the concerns of local residents.

"We ring the Department (EPA) to report excessive dust, and they say: "Which mine is the dust coming from?"

"And then they phone the mine to ask them if it's their dust. It's farcical."

And it's not only the dust from the mine (mostly larger particles PM10), but the health risks from diesel used in mining vehicles and equipment. Just one mine uses 20 million litres of diesel each year, according to Mr Krey, and there are no catalytic converters on mine equipment.

The mining industry is not interested in addressing the concerns of local residents, he says, but even more demoralising for local residents is the unwillingness of the government to control their activities.

Another member of the Bulga Milbrodale Progress Association, John Lamb, says this makes people angry and frustrated, and leads to negative impacts on people's mental health.

"It's the loss of control over our environment that is the most difficult. We came here to enjoy the peacefulness of the bush. Now there's continuous noise, plus the blasting – they shake the house and wake you up."

John Krey's wife Leslie says: "It's wrong that citizens should be forced to experience the emotional fall out from mining – the loss of amenity, the loss of quality of life, the loss of the future."

Appendix A
Air quality standards in Australia

The National Environment Protection (Ambient Air Quality) Measure (NEPM) developed in 1998 sets uniform national ambient air quality standards for six air pollutants: carbon monoxide; lead; sulphur dioxide; nitrogen dioxide; ozone and particles with diameter less than 10 μm (PM10). In 2003, an advisory reporting standard for particles with a diameter less than 2.5 μm (PM2.5) was added.[263]

In having no air quality standard for PM2.5, Australia is out of step with the World Health Organisation (WHO) guidelines. The WHO standard for PM2.5 is a 24 hour average of 25 μg/m^3 and annual average of no more than 10μg/m^3.[264] The WHO standard for PM10is a 24 hour average of 50 μg/m^3 and annual average of 20 μg/m^3.[265]

Australia's air pollution standards and implementation practices are outdated and do not reflect current air pollution science, although they are under review.[266] The current approach is to regulate to certain air quality targets as the standard, when in fact exposure to air pollution at the standard itself is not safe, and aiming to regulate to keep air quality from exceeding the (known to be inadequate) standard will fail to bring about reductions in air pollution to safer levels.[267]

Table 2.1: Ambient air quality NEPM standards and goals[268]

Pollutant	Averaging period	Maximum concentration	Goal within 10 years – maximum allowable exceedences
Carbon monoxide	8 hours	9.0ppm	1 day a year
Nitrogen dioxide	1 hour	0.12ppm	1 day a year
	1 year	0.03ppm	None
Photochemical oxidants	1 hour	0.10ppm	1 day a year
(as ozone)	4 hours	0.08ppm	1 day a year
Sulphur dioxide	1 hour	0.20ppm	1 day a year
	1 day	0.08ppm	1 day a year
	1 year	0.02ppm	None
Lead	1 year	0.50μg/m^3	None
Particles as PM10	1 day	50μg/m^3	5 days a year
Particles as PM2.5	1 day	25μg/m^3	Advisory reporting standard
	1 year	8μg g/m^3	

Appendix B
Economic analysis

Explanation of health costs of coal production

Coal mining, transport and combustion (otherwise known as coal production) in the Hunter Valley all cause 'external costs' or 'externalities'. This means that the production of coal leads to effects that are borne by people who are neither the direct producers, nor the consumers, of coal. Where these effects are negative the externalities are known as negative externalities. Negative externalities are often corrected by imposition of a financial penalty: a 'price' or tax on the offending item.

Health costs from coal production are a significant negative externality in the Hunter Valley.

The estimates for the health costs of air pollution (measured in dollar terms) in the Hunter Valley are based on a study by Pae Holmes Consultants in 2013.

The estimates of the health costs associated with coal-powered electricity in the Hunter Valley are based on an evaluation by Tom Beigler: *The Hidden Costs of Electricity: Externalities of power generation in Australia*, a 2009 report for Australian Academy of Technological Sciences and Engineering (ATSE).

Estimates of the social costs of carbon

The social cost of carbon seeks to measure the gap between the socially optimal price of carbon (on an intergenerational basis) and the actual price of carbon.

The estimates for the social costs of carbon, that is the cost to society associated with increased greenhouse gas emissions and other externalities, are drawn from a range of recognised sources.

Social costs should include all costs to society including but not limited to damage to agricultural productivity, infrastructure and harm to human health but many estimates fail to include all of the important physical, ecological, and economic impacts of climate change.[269]

The estimates used in the range presented in this report include the most recent assessment from the US Government Working Group on Social Cost of Carbon, estimates from economists Richard Tol and David Anthoff, and estimates from the international authority on the social costs of carbon, Lord Nicholas Stern, using both his published estimates, and an estimate of costs based on Sterns' recent comments that continued global warming now presents a "doubling of risk".[270]

Estimates of the value of the social cost of carbon vary widely, and it should be noted that even those estimates at the higher end may underestimate the costs of damage.

Explanation of Hunter Valley coal production estimates

Coal production is defined as the mining, transportation and combustion of coal in the Hunter Valley as well as the combustion of coal mined in the HV but combusted elsewhere in the world as a result of export from the Port of Newcastle.

This report has defined the Hunter Valley as the region surrounding the rail line from Newcastle through to Muswellbrook and west to Ulan. It includes the following nine Local Government Areas: Singleton Council, Muswellbrook Shire, City of Newcastle, City of Lake Macquarie, City of Cessnock, City of Maitland, Upper Hunter Shire, Wyong Shire, and Midwestern Regional Shire. Other reports have defined the HV in different terms.

Hunter Valley (HV) coal is defined as excluding the coal produced in the Gunnedah region and transiting the Werris – Muswellbrook rail corridor. This coal affects the HV via the air emissions from transit (i.e. coal dust and diesel exhaust sourced from coal trains) but the coal is mined elsewhere and is therefore excluded from the HV production estimates.

The estimate of coal production in the Hunter Valley in this report referenced the Australian Government Bureau of Resource and Energy Economics (BREE) June 2014 Quarterly report to calculate coal production from the areas defined as Hunter Valley in this report.

Forecast methodology for coal production from the Hunter Valley

Annual production from 2013 was estimated from BREE data.[271] Data from the Hunter Valley Corridor Capacity Strategy (HVCCC) 2012–2021 produced by the Australian Rail Track Corporation (ARTC) was used to calculate projected production in 2022. Produced by the Australian Rail Track Corporation Ltd (ARTC), which runs the railway system from the mines to the Port of Newcastle, the HVCCC document details the manner in which this corporation will meet the demand for coal transport in the HV corridor to the end of the forecast period. The graphs in this document detail likely coal production increases on a quarterly basis from 2013 to 2022. We have used the relevant graphs[272] to estimate projection of Newcastle Port coal exports, on a yearly basis, to 2022, excluding coal from the Gunnedah region.

ARTC provided forecasts for coal exports that are already contracted for delivery and forecasts of prospective coal exports. Prospective exports are exports that would occur if proposed mines are successfully advanced. Such mines are under active development but the owners are not ready to commit to contractual arrangements.

The following table shows projected increases to estimated actual 2013 coal production in the CAHA definition of the HV. These estimates use the ARTC projected growth in HV coal export production.

Local coal consumption is assumed to remain unchanged throughout the period as solar/ renewables/efficiency gains soak up any local demand increases.

Year ending	Dec 2013	Dec 2014	Dec 2015	Dec 2016	Dec 2017	Dec 2018	Dec 2019	Dec 2020	Dec 2021	Dec 2022
Contracted coal exports from Newcastle/Hunter Valley by HVCC 2013	145	160	165	165	175	185	185	185	185	185
Prospective coal exports from Newcastle/Hunter Valley by HVCC 2013	0	2	2	14	12	27	54	58	58	58
Total prospective and contracted coal exports from Newcastle/ Hunter Valley by HVCC 2013	145	162	167	179	187	212	239	243	243	243

The projections of growth allow us to calculate a total coal production number for the CAHA HV out to 2022. It shows coal production reaching 243 MTPA by 2022.

These figures have been independently verified by Francis Grey from Economists at Large.

Appendix C

Air emissions from power stations in 2012–13

The Eraring Power Station operated by Origin Energy on the shores of Lake Macquarie in the Hunter Valley produced 23,305,771 kg of sulphur dioxide; 15,856,714 kg of oxides of nitrogen; 395,233 kg of PM10; 201,799 kg of PM2.5; 1,972 kg ammonia; 76,190 kg of boron; 495,252 kg of fluoride; 942,694 kg of hydrochloric acid; 138,596 kg of VOCs; and 1,147,337 kg of carbon monoxide.

AGL Macquarie Bayswater Power Station at Muswellbrook produced 63,338,887 kg of sulphur dioxide; 37,574,171 kg of oxides of nitrogen; 932,765 kg of PM10; 523,995 kg of PM2.5; 2,665 kg ammonia; 70,682 kg of boron; 324,821 kg of fluoride compounds; 904,877 kg of hydrochloric acid; 220,145 kg of VOCs; and 1,836,703 kg of carbon monoxide.

Another AGL Macquarie plant, Liddell Power Station on Lake Liddell, produced 29,677,093 kg of sulphur dioxide; 15,335,437 kg of oxides of nitrogen; 287,703 kg of PM10; 159,544 kg of PM2.5; 1,463 kg ammonia; 69,193 kg of boron; 378,077 kg of fluoride compounds; 49,717 kg of hydrochloric acid; 95,785 kg of VOCs; and 792,823 kg of carbon monoxide.

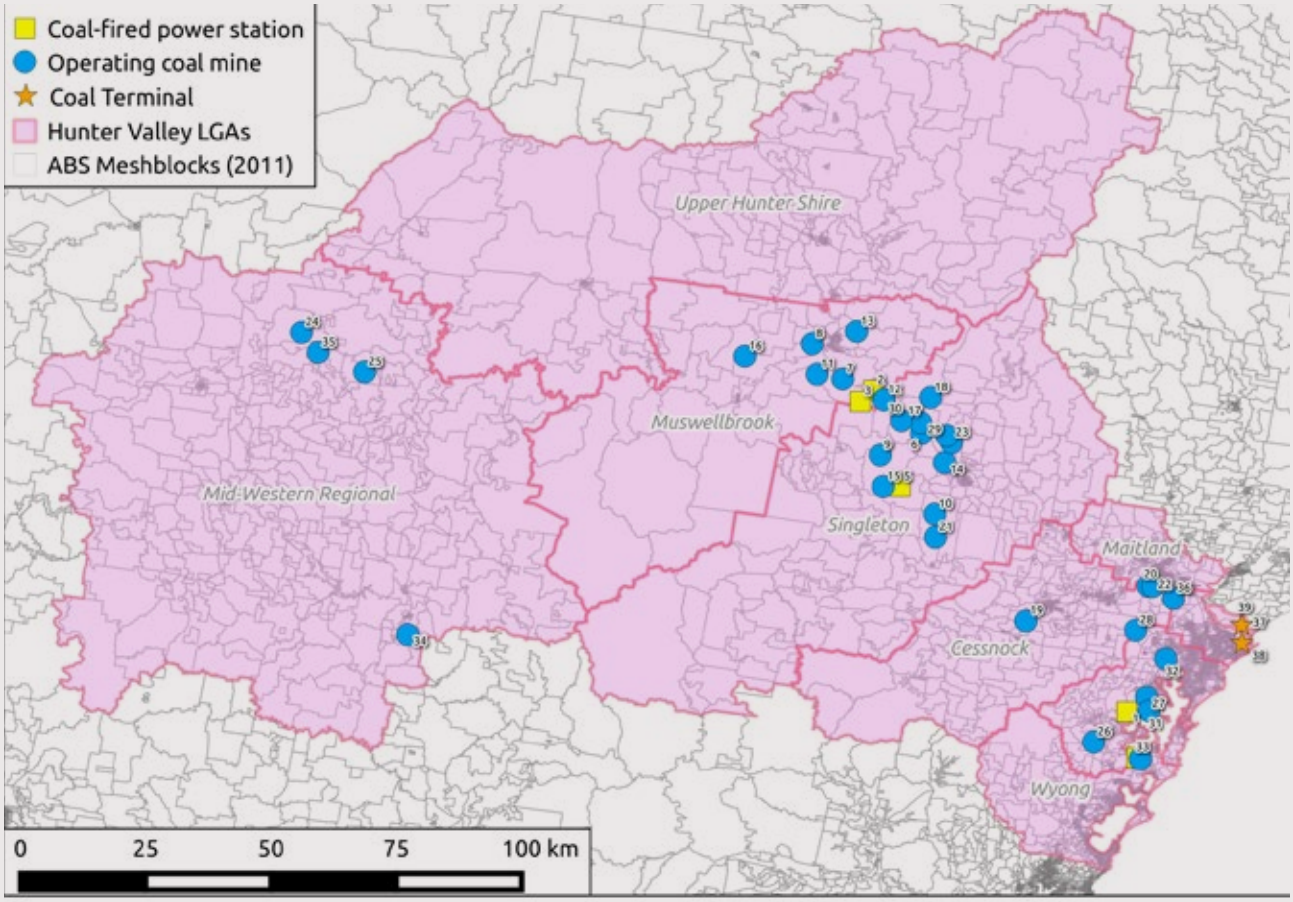
The NSW Government owned Delta Electricity operates the Vales Point Power Station also on the shores of Lake Macquarie. Vales Point produced 16,000,000 kg of sulphur dioxide; 22,000,000 kg of oxides of nitrogen; 41,300 kg of PM10; 3,900 kg of PM2.5; 1,300 kg of ammonia; 53,000 kg of boron; 54,000 kg of fluoride compounds; 290,000 kg of hydrochloric acid; 92,510 kg of VOCs; and 770,000 kg of carbon monoxide.

Redbank Power Station at Warkworth closed in 2013, however data for the previous reporting period was available. The pollutants recorded for Redbank include 1,854,223 kg of sulphur dioxide, 499,975 kg of oxides of nitrogen; 15,512 kg of PM10; 5,034 kg of PM2.5; 237 kg ammonia; 6616 kg of boron; 3933 kg of fluoride compounds; 368,933 kg of hydrochloric acid; 18,685 kg of VOCs; and 155,554 kg of carbon monoxide.

Source: *National Pollutant Inventory*, 2012-13.

Appendix D

Coal mines and coal-fired power stations in the Hunter Valley



Map produced by Herve Senot, Groundtruth

Appendix E

Coal fired power stations, coal mines and coal export terminals in the Hunter Valley

1	Coal-fired power station	Eraring	Origin Energy	Lake Macquarie
2	Coal-fired power station	Liddell	AGL Macquarie	Muswellbrook
3	Coal-fired power station	Bayswater	AGL Macquarie	Muswellbrook
4	Coal-fired power station	Vales Point	Delta Electricity	Lake Macquarie
5	Coal-fired power station	Redbank Power Station	Redbank Energy	Singleton
6	Operating coal mine	Ashton	Yancoal Australia Ltd	Singleton
7	Operating coal mine	Drayton (Muswellbrook)	Anglo American	Muswellbrook
8	Operating coal mine	Bengalla (Muswellbrook)	Coal and Allied, Rio Tinto Coal Australia	Muswellbrook
9	Operating coal mine	Hunter Valley Operations Lemington (Singleton)	Coal and Allied, Rio Tinto Coal Australia	Singleton
10	Operating coal mine	Mount Thorley (Warkworth)	Coal and Allied, Rio Tinto Coal Australia	Singleton
11	Operating coal mine	Mount Arthur (Muswellbrook)	BHP Billiton	Muswellbrook
12	Operating coal mine	Liddell	Liddell Coal, Glencore (Xstrata)	Muswellbrook
13	Operating coal mine	Muswellbrook Coal No. 1 and No. 2	Idemitsu Kosan Company Limited	Muswellbrook
14	Operating coal mine	Rix's Creek (Singleton)	Bloomfield Group	Singleton
15	Operating coal mine	Wambo (Warkworth)	Peabody Energy Australia	Singleton
16	Operating coal mine	Mangoola (Muswellbrook)	Glencore (Xstrata)	Muswellbrook
17	Operating coal mine	Glendell & Ravensworth East (Mt Owen complex)	Glencore (Xstrata)	Singleton
18	Operating coal mine	Mount Owen	Glencore (Xstrata)	Singleton

19	Operating coal mine	Austar (Paxton)	Yancoal Australia Pty Ltd	Cessnock
20	Operating coal mine	Bloomfield Colliery (Ashtonfield)	Bloomfield Group	Cessnock
21	Operating coal mine	Bulga	Glencore (Xstrata)	Singleton
22	Operating coal mine	Donaldson (Black Hill) Abel	Donaldson Coal, Yancoal Australia Pty Ltd	Maitland
23	Operating coal mine	Integra (Camberwell)	Vale Australia	Singleton
24	Operating coal mine	Ulan	Glencore (Xstrata)	Mid-Western Regional
25	Operating coal mine	Wilpinjong (Ulan-NSW)	Peabody Energy Australia	Mid-Western Regional
26	Operating coal mine	Mandalong	Centennial Coal Co Ltd	Lake Macquarie
27	Operating coal mine	Newstan	Centennial Coal Co Ltd	Lake Macquarie
28	Operating coal mine	Tasman	Donaldson Coal, Yancoal Australia Pty Ltd	Lake Macquarie
29	Operating coal mine	Integra UG	Vale Australia	Singleton
30	Operating coal mine	Ravensworth Operations	Glencore (Xstrata)	Singleton
31	Operating coal mine	Myuna	Centennial Coal Co Ltd	Lake Macquarie
32	Operating coal mine	West Wallsend	Glencore (Xstrata)	Lake Macquarie
33	Operating coal mine	Chain Valley	Lake Coal Pty Ltd	Lake Macquarie
34	Operating coal mine	Charbon	Centennial Coal Co Ltd	Mid-Western Regional
35	Operating coal mine	Moolarben	Yancoal Australia Pty Ltd	Mid-Western Regional
36	Operating coal mine	Abel	Donaldson Coal, Yancoal Australia Pty Ltd	Maitland
37	Coal Terminal	Kooragang Port Waratah Coal Services	Port Waratah Coal Services	Newcastle
38	Coal Terminal	Carrington	Port Waratah Coal Services	Newcastle
39	Coal Terminal	Kooragang Island	Newcastle Coal Infrastructure Group	Newcastle

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