

SUBMISSION TO THE EPBC ACT REVIEW

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Name

Chris Pilgram

Organisation

Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)

State or Territory

Outside Australia

Areas of interest

The objects of the Act; Matters of National Environmental Significance; Environmental Impact Assessments; Cumulative impacts; Climate change; Compliance and enforcement; Decision making; Biodiversity; Water

Attachment provided?

Yes

Do you give permission for your submission to be published?

Yes - with my name and/or organisation

SUBMISSION RESPONSES

QUESTION 1: Some have argued that past changes to the EPBC Act to add new matters of national environmental significance did not go far enough. Others have argued it has extended the regulatory reach of the Commonwealth too far. What do you think?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) is largely satisfied with the current list of Matters of National Environmental Significance (MNES) in the amended Act. However, the IESC agrees that past changes to the EPBC Act to add new MNES did not go far enough and it strongly advocates the inclusion of a 'greenhouse trigger' to strengthen the Act's capacity to more effectively protect the planet's entire 'critical zone'. On land, this zone extends from above the tree canopy down into the groundwater to encompass the entire boundary layer where soil, water, air and living organisms interact. Reasons for suggesting the inclusion of a 'greenhouse trigger' are discussed in more detail in the IESC's response to Question 4. The inclusion of the 'water trigger' as an MNES was an especially important addition for the IESC (which was formed in 2012; see Sections 505C and 505D of the EPBC Act). Before then, the most relevant MNES to the IESC were wetlands of international importance (listed under the Ramsar Convention), listed threatened species and ecological communities, listed migratory species protected under international agreements, and, potentially, the Great Barrier Reef Marine Park. In 2013, there was an amendment informally called the 'water trigger' that added a further Matter: 'a water resource in relation to coal seam gas and large coal mining'. In this amendment, 'water resource' is defined according to the Water Act 2007 as: '(a) surface water or ground water; or (b) a

watercourse, lake, wetland or aquifer (whether or not it currently has water in it); and includes all aspects of the water resource (including water, organisms and other components and ecosystems that contribute to the physical state and environmental value of the water resource).’.

The addition of this Matter allowed the IESC to provide Commonwealth and state regulators with much more comprehensive and integrated scientific advice that:

- (1) covered potentially impacted surface waters and groundwaters (both quantity and quality) whose catchments and/or recharge areas often span multiple states,
- (2) addressed issues of direct community concern about potentially irreversible impacts of an industry on a limited resource, and,
- (3) provided an holistic perspective of possible direct and indirect exposure pathways whereby activities associated with large coal mining or coal seam gas development may affect hydrogeological, hydrological, chemical, biogeochemical, ecotoxicological and ecological processes potentially impacting valued biota and/or ecosystem services that were not adequately covered by the other MNES.

Hunter (2017)¹ provides a detailed independent assessment of the ‘water trigger’, concluding that it has been highly successful. In particular, this assessment states that the impact of the ‘water trigger’ has been to strengthen adaptive management in a domain in which the potential impacts to water are often uncertain, occur over a long period, and carry significant risks in terms of consequences. It also asserts that the Commonwealth’s policy in setting conditions to address gaps in state assessment and regulatory decisions relative to the requirements of the ‘water trigger’ legislation has served to integrate Commonwealth and state regulatory arrangements. Another conclusion is that public confidence in the regulatory system as a whole is likely enhanced by knowing that independent expert scientific expertise is applied to consideration of potential impacts to water resources of coal seam gas and large coal mining developments and, in accordance with the intention of the legislation, has been applied directly to water as a Matter of National Environmental Significance in the setting of environmental conditions for the project to commence.

Based on the favourable review by Hunter (2017) and the IESC’s own experience over the last seven years (including assessment of over 125 projects), the Committee suggests that there would be substantial merit in extending the ‘water trigger’ to include developments targeting extraction of other unconventional gases (i.e. other than coal seam gas). Benefits of this extension include:

- (1) public concerns about the potential impacts of unconventional gas extraction on water are similar to those concerns about potential impacts of coal seam gas extraction, and may be largely allayed by the knowledge that proposals would be reviewed by independent expert scientists who would specifically consider potential impacts to water resources at multiple spatial and temporal scales,
- (2) there is sufficient scientific expertise within the IESC that a new committee would not be required to address proposals for unconventional gas extraction (however, there would be additional resources needed for the Office of Water Science who currently provides crucial administrative and technical support to the Committee), and,
- (3) the same advantages described in 1-3 above.

Further, the IESC agrees with the point raised by McCormick et al. (2013, p. 25)² that as other forms of hard-rock mining, particularly those that excavate beneath the water table, are likely to have significant impacts on water resources, it is logical to extend the ‘water trigger’ to these activities also. However, the large number of these activities would probably require substantial resources and a second independent expert scientific committee.

The IESC does not consider that the addition of new MNES to the EPBC Act has extended the regulatory reach of the Commonwealth too far. For example, catchments and channels of many surface water resources span multiple states, potentially complicating state-level assessment and legislation. Similarly, groundwater basins and their recharge areas often cross state borders, with

discharge sometimes occurring in a different state from the recharge zone. In these situations and using the 'water trigger' as an example, Commonwealth oversight complements multi-state legislation to provide effective landscape- and regional-scale management of potential impacts of coal seam gas and large coal mining development on water resources. This complementary oversight and its environmental effectiveness in protecting the 'critical zone' (i.e. beyond just water resources as currently covered under the 'water trigger') would be substantially enhanced by the addition of a 'greenhouse trigger' as a further MNES (see the IESC's response to Question 4).

1 Hunter, S. (2017). The Independent Review of the Water Trigger Legislation. Commonwealth of Australia, Canberra. <http://www.environment.gov.au/system/files/resources/905b3199-4586-4f65-9c03-8182492f0641/files/water-trigger-review-final.pdf> [Accessed 20 January 2020].

2 McCormick, W., St John, A. & Tomaris, J. (2013). Environment Protection and Biodiversity Conservation Amendment Bill 2013. Bills Digest no. 108, 2012–13 (28 pp.) Parliament of Australia, Department of Parliamentary Services, Canberra. https://www.aph.gov.au/sitecore/content/Home/Parliamentary_Business/Bills_Legislation/bd/bd1213a/13bd108 [Accessed 20 January 2020].

QUESTION 3: Should the objects of the EPBC Act be more specific?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) considers that the objects of the EPBC Act should be more specific because this will substantially assist regulators in applying the Act. For example, in the 'Significant impact guidelines 1.1' of the 'Matters of National Environmental Significance' document, "a significant impact" is defined as:

"... an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on the environment."

(Department of the Environment, Water, Heritage and the Arts, 2013, p. 3).

In this situation, assessment of 'significance' is somewhat subjective yet is essential in deciding whether or not an action is 'significant' and therefore needs referral to the Minister. It is accepted that many terms and concepts in environmental science are elusive and difficult to describe succinctly (like the example above) but making the objects of the Act more specific and having consistent definitions that apply across state and Commonwealth legislation will reduce the risk of misapplication of the EPBC Act.

Another example of the value in making the objects of the EPBC Act more specific lies in emphasising the Act's intention to protect the environment by conserving its ecological processes as well as its biodiversity. Currently, the Act's objects as stated in Item 3 on p1 include 'to promote the conservation of biodiversity'. However, there is no specific mention of promotion of the conservation of ecological processes or ecosystem resilience. Both of these aspects are now widely accepted by environmental scientists as being crucial to the maintenance of functional ecosystems and their capacity to withstand disturbances, including those by human activities, and the IESC suggests that they should be explicitly included in the objects of the Act. In the EPBC Act, the term 'ecological integrity' is mentioned only once (in Item 3A(d)) as a part of one of the principles of ecologically sustainable development but the term 'ecological integrity' is not defined in the Act's Definitions (Item 528).

The objects of the EPBC Act (or indeed the rest of the Act) never mention 'cumulative impacts' or 'climate change' yet both these features are now recognised as being fundamental to the effective protection of biodiversity and the environment, especially in the context of the uncertainty of their likely escalating impacts on ecological processes, environmental sustainability and ecosystem resilience. The IESC urges that both cumulative impacts and climate change should be explicitly

included in the Act, preferably as specific components of the objects so that their central importance and relevance to Australia's environmental protection is emphasised and legislated appropriately.

3 Department of the Environment, Water, Heritage and the Arts (2013). Significant Impact Guidelines 1.1 - Matters of National Environmental Significance. Australian Government, Commonwealth of Australia, Canberra.

<https://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance> [Accessed 20 January 2020].

QUESTION 4: Should the matters of national environmental significance within the EPBC Act be changed? How?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) strongly supports the addition of an MNES to the EPBC Act in the form of a 'greenhouse trigger' similar to the one proposed on 16 November 2000 by the then-Minister for Environment and Heritage, Senator Robert Hill, that major new developments would trigger the EPBC Act if they were likely to result in greenhouse gas emissions of more than 0.5 million tonnes of carbon dioxide equivalent in any 12-month period

(<https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id:%22media/pressrel/67W26%22>, [accessed 21 Jan 2020]). However, the IESC considers that there should be some latitude in the trigger value and disagrees that a specific value like 'more than 0.5 million tonnes of carbon dioxide equivalent in any 12-month period' should be explicitly stated in the Act. This latitude would allow flexibility in assessments by the relevant Environmental Minister as to whether a given proposal would trigger the Act.

In 2000, Senator Hill claimed that the 'greenhouse trigger' process would consider environmental, economic and social factors so that effects on international competitiveness and regional development would be factored into the assessment and approval process. Further, the delivery of any net greenhouse benefits, such as those obtained by the adoption of new technology, would also be included in the assessment. Although the Coalition made a commitment in their 2001 election policy to complete consultations on the inclusion of a greenhouse trigger in the EPBC Act, the Howard Government never proceeded with adding this 'greenhouse trigger' to the list of MNES in the EPBC Act (McCormick et al. 20132). In passing, the IESC notes that Recommendation 10 of the Hawke (20094) review of the EPBC Act also suggested an interim greenhouse trigger, with a threshold of at most 500,000 tonnes of carbon dioxide equivalent emissions, be introduced as soon as possible until the commencement of a Carbon Pollution Reduction Scheme; and that the Act be amended to insert a requirement to consider cost-effective climate change mitigation opportunities as part of strategic assessments and bioregional planning processes.

The main reason that the IESC strongly supports this 'greenhouse trigger' is that its inclusion will greatly strengthen the Act's capacity to more effectively protect the planet's entire 'critical zone'. This zone, which on land extends from above the tree canopy down into the groundwater, encompasses the boundary layer where soil, water, air and living organisms interact. These complex interactions, among other roles, regulate conditions and processes in the natural habitat, sustain biodiversity, and support the provision of life-sustaining resources (e.g. food and water) and other ecosystem services critical to human existence. The 'greenhouse trigger' would complement the protection to water resources afforded by the 'water trigger' and ensure that the full range of potential impacts of a project could be evaluated holistically, including those that may affect atmospheric conditions and air quality.

A second reason is because of the overwhelming scientific evidence that the climatic extremes and higher average air temperatures experienced across much of Australia in the last decade are due, in part, to anthropogenic greenhouse gas emissions. The social and economic toll of these extreme climatic conditions (e.g. prolonged drought, severe bushfires) is enormous. An amendment to add a 'greenhouse trigger' would include assessment of how best to reduce this impact and help Australia

meet its international responsibilities in a cost-effective way. An independent and trusted committee of scientific experts could be involved in the assessment of projects under such a 'greenhouse trigger', emulating the highly successful model of IESC involvement in the current 'water trigger' process.

2 McCormick, W., St John, A. & Tomaris, J. (2013). Environment Protection and Biodiversity Conservation Amendment Bill 2013. Bills Digest no. 108, 2012–13 (28 pp.) Parliament of Australia, Department of Parliamentary Services, Canberra.

https://www.aph.gov.au/sitecore/content/Home/Parliamentary_Business/Bills_Legislation/bd/bd1213a/13bd108 [Accessed 20 January 2020].

4 Hawke, A. (2009). The Australian Environment Act – Report of the Independent Review of the Environment Protection and Biodiversity Conservation Act 1999. Australian Government Department of the Environment, Water, Heritage and the Arts, Canberra.

<https://www.environment.gov.au/legislation/environment-protection-and-biodiversity-conservation-act/epbc-review-2008> [Accessed 18 January 2020].

QUESTION 5: Which elements of the EPBC Act should be priorities for reform? For example, should future reforms focus on assessment and approval processes or on biodiversity conservation? Should the Act have proactive mechanisms to enable landholders to protect matters of national environmental significance and biodiversity, removing the need for regulation in the right circumstances?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that one priority for reform should be a greater focus on protecting hydrological, biogeochemical, ecological and evolutionary processes (e.g. groundwater flux, surface water flows, ecological connectivity, biogeochemical pathways of nutrients) at large spatial scales (landscapes, regions and nationally) over commensurate timescales (e.g. decades, centuries) to complement the emphasis in the current Act on biodiversity conservation. Although the Act acknowledges the importance of these broader spatial and temporal scales, it was drafted at a time when technological tools such as remote sensing methods and large data storage and retrieval platforms (including the Web) were in their infancy. Further, in the last two decades there has been greater scientific recognition of the fundamental importance of landscape-scale ecological processes and connectivity, legacy effects and nonlinear cumulative effects, and this enhanced understanding needs to be specifically encapsulated in the Act.

The IESC suggests that a second priority for reform (relevant to the environmental assessment and approvals process) is the need for a focus on outcomes-based assessments. These outcomes must be clearly stated, measurable, realistic, achievable, adequately resourced and placed into a temporal context that dictates periods of time after which one or more outcomes will be achieved. Currently, many outcomes predicted in environmental impact assessments are aspirational, equivocal and generic, and seldom accompanied by measurable indicators and time scales. Further, outcomes-based assessments must also be complemented with comprehensive risk analyses. The importance of comprehensive risk analysis is emphasised in the IESC's Information Guidelines for proponents of large coal mines or coal seam gas development (available at <http://www.iesc.environment.gov.au/information-guidelines>), along with specific supplementary Explanatory Notes on topics such as uncertainty analysis in groundwater modelling. Explicitly addressing sources of uncertainty in all outcomes-based assessments should be specified in the Act because of the challenges of evaluating these sources against a background of immense inherent spatial heterogeneity and increasing climatic variability. For example, if a proponent for a major development claims that a certain landscape (including surface and subsurface waters) will eventuate after a given activity for a given period of time, convincing evidence must be presented showing causal pathways and mechanisms by which such an outcome will be achieved. Monitoring to demonstrate progress towards this outcome and then its persistence is essential.

Although assessment and approval processes are important, it is equally crucial to have credible management plans and scientific evidence demonstrating how such processes will achieve a desired and agreed outcome, as specified in a reformed EPBC Act. Methods to avoid, mitigate or manage risks (including cumulative ones) that were identified in the initial environmental impact assessment should be explicitly addressed in these management plans. These plans could then be reviewed by an independent panel of expert scientists to determine whether the measures to reduce impacts on biodiversity and ecological integrity are adequate and whether potential sources of uncertainty and other risks have been fully considered.

A third priority for reform of the EPBC Act that the IESC advocates is the encouragement of proactive measures to enable landholders to protect MNES and biodiversity. Measures that help address cumulative impacts at landscape and regional scales should be especially encouraged. In particular, the IESC suggests that the Act should specifically encourage collaboration among companies and members of a particular industry to help provide and carry out effective and integrated management plans and monitoring programs that produce a desired landscape-scale outcome and reduce collective impacts, especially along river systems or groundwater flowpaths.

Although the IESC agrees that the Act should have proactive mechanisms to enable landholders to protect matters of national environmental significance and biodiversity, the Committee still sees a need for regulation to (a) complement the landholders' actions in case they are insufficient to adequately protect environmental assets and (b) ensure a framework for monitoring the effectiveness of the mechanisms is in place. Design and application of a suitable monitoring framework (including sampling and data storage, analysis and interpretation) are crucial in outcomes-based assessments to ensure that outcomes are achieved in the stated time frames and that where necessary, changes can be made to the management of the environment in response to changing conditions and activities (i.e. adaptive environmental management).

QUESTION 6: What high level concerns should the review focus on? For example, should there be greater focus on better guidance on the EPBC Act, including clear environmental standards? How effective has the EPBC Act been in achieving its statutory objectives to protect the environment and promote ecologically sustainable development and biodiversity conservation? What have been the economic costs associated with the operation and administration of the EPBC Act?

From direct experience through its activities supported by the EPBC Act, the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests four high-level concerns that it considers would be relevant to the review and where the Act should play a stronger role:

- (1) A mandate that all data collected for environmental projects (from application to post-project monitoring) should be housed in a centrally coordinated, comprehensive, adequately resourced and regularly updated national environmental database that is publicly accessible and searchable;
- (2) Explicit inclusion of and guidance about the protection of ecological and evolutionary processes that contribute to sustaining the integrity of ecosystems and communities, including supporting their ecosystem services;
- (3) Legislative support and guidance for landscape-, regional- and national-scale assessments of (a) subsurface waters, (b) long-term changes against a backdrop of predicted climatic change, and (c) cumulative impacts whose causes and results may not be simply additive but change dramatically when a threshold is exceeded; and,
- (4) Recommendations for greater use of independent scientific expert panels to improve the consistency and quality of the environmental assessments of industries whose activities may have local and landscape-level repercussions and affect biodiversity and ecological processes.

Each of these concerns is discussed in more detail below.

Currently, much of the data gathered for various stages (e.g. initial environmental impact assessments, monitoring required by environmental conditions of consent) of developments that

may have impacts on biodiversity and the environment is not publicly accessible nor is it stored in a central national database. These data typically comprise site-specific information on groundwater levels and water quality, surface water dynamics and physicochemistry, soil parameters, and survey data for flora and fauna, and are often collected repeatedly over time from reference and impacted sites. In general, collecting empirical data is expensive and time-consuming but the information is crucial for numerous applications, including bioregional assessments, baseline surveys and testing the predictions of hydrological and ecological cause-effect models. However, seldom are these data made available for public access nor is the information stored in a centrally coordinated, comprehensive, adequately resourced and regularly updated national environmental database. If the EPBC Act legislated that all environmental data collected to support development proposals and monitor their potential impacts must be placed on a national environmental database that is publicly accessible, then the value of these data would be far greater in enhancing protection of biodiversity and the environment. Already, there are some platforms where such data could be stored (e.g. Atlas of Living Australia [www.ala.org.au]) and these could either be linked to other national databases and mapping tools (e.g. Google Earth) or supplemented with dedicated databases that include concurrent environmental information. Although approvals for many developments include conditions that stipulate environmental monitoring data should be collected, these conditions seldom specify that the information should be entered into a central and publicly accessible database.

In keeping with its objects, the EPBC Act should explicitly specify the need to protect ecological and evolutionary processes that contribute to sustaining the integrity of ecosystems and communities, including supporting their ecosystem services. In addition, the Act should include practical guidance to proponents of project proposals about how to protect these processes and how to monitor the effectiveness of proposed protective measures. Currently, almost all of the ecological focus in environmental impact assessments is on specific individual species and communities, usually only those that are listed as threatened, endangered or vulnerable. However, the ecological and evolutionary processes that sustain the species and their habitats and/or that provide crucial ecosystem services may not be adequately protected or even monitored. In many cases, these processes are poorly known. However, the IESC notes that when cause-effect pathways are conceptually modelled to identify potential impacts of a given development, the loss or impairment of one or more ecological processes usually underpins an important impact pathway and often involves disruption of hydrological, biogeochemical or ecological connectivity in an ecosystem. The objects of the EPBC Act would be strengthened considerably by specific inclusion of protection of ecological and evolutionary processes to complement the protection of biodiversity and listed species, communities and ecosystems.

The IESC considers that the EPBC Act should include legislative support and practical guidance for landscape-, regional- and national-scale assessments of subsurface waters to complement equivalent assessments of surface assets, and to provide a collective baseline context for individual developments. Technological tools such as remote sensing are powerful ways of mapping surface resources at landscape, regional and national scales but are far less effective for mapping subsurface waters at large spatial scales. The EPBC Act should also legislate for better assessment of potential long-term changes against a backdrop of predicted climatic change because many environmental impact assessments where the effects are predicted to persist for decades fail to consider such changes adequately. A third high-level concern also operating at large spatial and temporal scales is the appropriate assessment of cumulative impacts, especially in situations when causes and results may not be simply additive but change dramatically when a threshold is exceeded. The Committee urges specific addition of legislation in the Act that specifies the need to assess potential impacts of a proposed development on biodiversity and the environment at appropriately large spatial and temporal scales, includes analysis of long-term changes against a backdrop of predicted climate change, and explicitly models potential cumulative impacts given previous, present and likely future activities in the area.

Where particular activities or developments are likely to have major, widespread and/or persistent impacts (e.g. contaminated groundwater or soil, poor air quality), then independent scientific expert panels like the IESC are likely to substantially improve the quality and consistency of environmental assessments. This is especially true where the potential consequences of a given activity or development are of great community concern. Over the past seven years of assessing over 125 proposals for coal seam gas and large coal mining developments, the IESC has been able to provide Commonwealth and state regulators with comprehensive and integrated scientific advice that has improved the protection of biodiversity and the environment while still enabling economic extraction of natural resources. Feedback to the IESC from regulators, the mining industry and community stakeholders has been positive because all players respect the independence and quality of the science underpinning the advice from the IESC. The Committee is not a regulator and does not decide whether or not a project should occur. However, it is able to provide an holistic perspective of possible direct and indirect exposure pathways whereby activities associated with large coal mining or coal seam gas development may affect hydrogeological, hydrological, chemical, biogeochemical, ecotoxicological and ecological processes potentially impacting valued biota and/or ecosystem services. In addition, the IESC (supported by the Office of Water Science) also oversees relevant research and provides 'explanatory notes' and other guidance to address information gaps to improve the environmental assessment process. These roles, performed by a suitably qualified panel of independent scientific experts, could be performed by equivalent committees and legislated under the Act for activities and industries whose impacts on biodiversity and the environment are likely to be major, widespread and/or persistent and that are of great community concern.

For example, should there be greater focus on better guidance on the EPBC Act, including clear environmental standards?

The IESC does not consider that providing clear environmental standards in the EPBC Act would be especially useful because in many cases, environmental standards and guideline values are place- and time-specific, and therefore could not be readily summarised in a national Act (except as guiding principles). Further, many environmental standards and values (e.g. water and sediment quality guidelines) are being continually revised as new scientific information is obtained which would mean that the guidance in the Act might quickly become out-dated and potentially unreliable.

QUESTION 7: What additional future trends or supporting evidence should be drawn on to inform the review?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) agrees strongly with the sentiment that recommendations from this independent review should be fit for the future, and suggests that the review would benefit from information on future trends (1) in surface and groundwater levels and water quality nationally, (2) on how groundwater-dependent ecosystems are expected to vary in distribution and composition (in response to, for example, climate change and altered water/land use), and (3) on how groundwater flux (especially in northern Australia and around the margins of the Great Artesian Basin) might change over time. However, the IESC notes with concern that almost one billion dollars (\$872M in 2010) of national groundwater monitoring infrastructure is in a state of decline, with half of it predicted to be non-operational by 2034 and all of it defunct by 2062 (Sinclair Knight Merz 20125). Without these national monitoring bores providing reliable data on what is arguably one of Australia's most important freshwater resources, assessing the success or otherwise of the EPBC Act in protecting ecological processes and biodiversity of groundwaters and their dependent ecosystems is impossible. There seems to be no national strategy for addressing this important issue yet this information is needed for revision of legislation and guidelines to protect groundwater quality,

biodiversity and ecological integrity to the same extent as surface waters.

There are many useful sources of supporting evidence that could provide information on environmental trends and to predict future trajectories in situations with limited spatial and temporal field data. One example is the use of nationally available remotely sensed Water Observations from Space (WOfS) dating back to 1987 to cost-effectively re-create historic records of surface water regimes of many more groundwater-dependent wetlands in South East South Australia than could be feasibly monitored manually (Harding et al. 2018)⁶. Integrating these derived water regimes with data from digital elevation models of basin bathymetries ascertained using light detection and ranging (LiDAR) yielded 30-year trends in surface water expression in areas where groundwater levels have changed in response to rainfall variability and groundwater extraction and interception.

Over the last decade, there has been a rapid increase in the availability, efficiency and effectiveness of tools and approaches to surveying biodiversity and ecological processes that can now be used to improve environmental decision-making (Pimm et al. 2015)⁷. These include transformative technological advances for studying species and their environments (Allan et al. 2018)⁸ and molecular methods, such as eDNA metabarcoding, that enable rapid assessment of biological diversity from the DNA found in diverse sources including soil and water (Deiner et al. 2017)⁹. Another important source of supporting evidence is information derived from Indigenous knowledge. Such information has already contributed greatly to decision-making in water management in Australia (e.g. Leidloff et al. 2013¹⁰; Jackson et al. 2015¹¹). This rich source of knowledge can powerfully augment the discrete observations in space and time that typically support water and ecological management because Indigenous knowledge extends over very long time periods and can integrate traditional knowledge about hydroecological responses over that time. Currently, this knowledge is accessed via combinations of archaeological, anthropological and sociological means (e.g. legends, place names and oral histories) to provide observations linking water use and the responses of aquatic ecosystems (Woodward et al. 2012)¹². In environmental impact assessments, such observations could be used to inform water models and provide constraints on the uncertainties associated with the setting of water and land allocation limits (e.g. Fassnacht et al. 2018)¹³.

5 Sinclair Knight Merz (2012). An assessment of groundwater management and monitoring costs in Australia. Waterlines Report 90, National Water Commission, Canberra.

6 Harding, C., Herpich, D. & Cranswick, R. H. (2018). Examining temporal and spatial changes in surface water hydrology of groundwater dependent ecosystems using WOfS (Water Observations from Space): southern Border Groundwaters Agreement area, South East South Australia, DEW Technical report 2018/08, Government of South Australia, Department for Environment and Water, Adelaide.

<http://www.waterconnect.sa.gov.au/Content/Publications/DEW/Temporal%20changes%20in%20wetland%20hydrology%20using%20WOfS.pdf> [Accessed 11 March 2020].

7 Pimm, S.L., Alibhai, S., Bergl, R., Dehgan, A., Giri, C., Jewell, Z., Joppa, L., Kays, R. & Loarie, S. (2015). Emerging technologies to conserve biodiversity. *Trends in Ecology & Evolution*, 30, 685–696.

8 Allan, B.M., Nimmo, D.G., Ierodiaconou, D., VanDerWal, J., Koh, L.P. & Ritchie, E.G. (2018.)

Futurecasting ecological research: the rise of technoecology. *Ecosphere*, 9(5), e02163.

10.1002/ecs2.2163

9 Deiner, K., Bik, H.M., Mächler, E., Seymour, M., Lacoursière-Roussel, A., Altermatt, F., Creer, S.,

Bista, I., Lodge, D.M., de Vere, N., Pfrender, M.E. & Bernatchez, L. (2017). Environmental DNA metabarcoding: Transforming how we survey animal and plant communities. *Molecular Ecology*, 26, 5872-5895.

10 Liedloff, A.C., Woodward, E.L., Harrington, G.A. & Jackson, S. (2013). Integrating indigenous ecological and scientific hydro-geological knowledge using a Bayesian network in the context of water resource development. *Journal of Hydrology*, 499, 177–187.

11 Jackson, S., Pollino, C., Maclean, K., Bark, R. & Moggridge, B. (2015) Meeting Indigenous peoples' objectives in environmental flow assessments: Case studies from an Australian multi-jurisdictional water sharing initiative. *Journal of Hydrology*, 522, 141–51.

12 Woodward, E., Jackson, S., Finn, M. & Marrfurra McTaggart, P. (2012). Utilising Indigenous seasonal knowledge to understand aquatic resource use and inform water resource management in northern Australia. *Ecological Management and Restoration*, 13, 58–64.

13 Fassnacht, S.R., Allegretti, A.M., Venable, N.B.H., Fernández-Giménez, M.E., Tumenjargal, S., Kappas, M., Laituri, M.J., Batbuyan, B. & Pfohl, A.K.D. (2018). Merging Indigenous knowledge systems and station observations to estimate the uncertainty of precipitation change in central Mongolia. *Hydrology*, 5, Article 46.

QUESTION 8: Should the EPBC Act regulate environmental and heritage outcomes instead of managing prescriptive processes?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that the EPBC Act should do both: regulate environmental and heritage outcomes and, to assist the achievement of these outcomes, provide and manage relevant prescriptive processes. As advocated in its response to Question 5, the IESC strongly supports the inclusion within the EPBC Act of explicit regulation to achieve desired and clearly specified outcomes at suitably broad spatial and temporal scales. The Committee is not qualified to comment on heritage outcomes but would see the environmental outcomes as being ones where biodiversity, ecological integrity, resilience and self-sustaining ecological processes are enhanced or at least conserved. The Act may wish to phrase some of these environmental outcomes in terms of providing direct and indirect ecosystem services for use in appropriately comprehensive cost-benefit analyses so that decision-making is strategic, holistic and integrated (see the IESC's response to Question 2). Regulation of these outcomes should explicitly consider cumulative impacts (so that the Act is not restricted on a case-by-case application) and should specify whose responsibility it is to predict and manage these impacts (especially in situations where companies may be concerned about commercial-in-confidence data). Further, regulation of outcomes should consider the appropriateness and validity of offsetting mechanisms. For many water resources, there is considerable debate about whether 'like for like' offsets are able to address dependence of the offset on surface water and/or groundwater. For example, in the Sydney Basin, the validity of offsets to protect coastal upland swamps is challenged by uncertainty about the relative dependency of these ecosystems on surface versus groundwater water sources and also whether the offset swamps are actually meeting the 'no worse' or 'better' criteria. The EPBC Act's regulation of environmental outcomes should specify how the appropriateness of offsets will be validated when cumulative impacts are being assessed in areas where there is a shortage of suitable candidate ecosystems as 'replacements'.

QUESTION 9: Should the EPBC Act position the Commonwealth to take a stronger role in delivering environmental and heritage outcomes in our federated system? Who should articulate outcomes? Who should provide oversight of the outcomes? How do we know if outcomes are being achieved?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) strongly recommends that the EPBC Act should position the Commonwealth to be able to take a stronger role in delivering environmental outcomes in our federated system, especially given the disturbing trends in most environmental parameters over the last two decades. Together, the Australian Government and the state and territory governments should articulate the outcomes to provide clear guidance for application of the Act. Outcomes vary from the conservation of a given ecosystem, plant association or water resource capable of persisting and carrying out natural ecological processes through to landscape- and regional-level outcomes of mosaics of interacting surface and subsurface ecosystems that have particular desired features and values. An outcome might also be the maintenance of a given hydrological, biogeochemical or ecological or evolutionary process that provides one or more ecosystem services. Currently, the EPBC Act does not seem to be very clear about what an 'outcome' is so that is why clearer articulation and definition are both needed.

In light of the national scale of many of the likely environmental outcomes and their drivers, the IESC reasons that it is logical that the Australian Government should provide oversight of these outcomes. This oversight should be in close collaboration with relevant state and territory governments to encourage initiatives such as on-ground management and protection, local monitoring of activities (potentially involving citizen scientists), and appropriate community consultation and support.

The achievement of these outcomes would be demonstrable through analysis of robust monitoring data, much of which should be collected nationally and using comparable and reliable sampling methods. The IESC has concerns that some national monitoring infrastructure is deteriorating rapidly (e.g. Australia's groundwater monitoring network; see IESC's response to Question 7) and requires strategic replacement and maintenance so that trends in environmental parameters and outcomes can be monitored. Where development projects are proposed, the EPBC Act should specify that environmental data before, during and after the project are collected and used by the proponent to show the successful achievement of the desired outcome. The Act should also specify that all these data should be made publicly available. Conceptual models of causal pathways and processes (e.g. hydrological, biogeochemical, ecological) that result in the achievement and persistence of a desired outcome would also be valuable in helping demonstrate that the outcomes are being achieved. Finally, there should be some mutually agreed assessment endpoints (with unambiguous measurement endpoints) that would satisfy legislative and community concerns that the outcomes were achieved and continue to be so.

QUESTION 10: Should there be a greater role for national environmental standards in achieving the outcomes the EPBC Act seeks to achieve? In our federated system should they be prescribed through:

- **Non-binding policy and strategies?**
- **Expansion of targeted standards, similar to the approach to site contamination under the National Environment Protection Council, or water quality in the Great Barrier Reef catchments?**
- **The development of broad environmental standards with the Commonwealth taking a monitoring and assurance role? Does the information exist to do this?**

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) believes there should be a greater role for national environmental standards in achieving the outcomes the EPBC Act but does not suggest that prescriptive standards should be specified within the Act itself (see IESC's response to Question 6). Instead, the Committee advocates that the Act should refer to guidelines to support the intent of the Act so that these guidelines can

be readily updated as the need arises. Further, as many prescriptive standards are context-dependent and site-specific, national standards may have only limited value. For example, the IESC recommends that proponents of large coal mining and coal seam gas developments should use site-specific guidelines and has published an Explanatory Note describing how to do this ('Deriving site-specific guideline values for physico-chemical parameters and toxicants', <http://www.iesc.environment.gov.au/publications/information-guidelines-explanatory-note-deriving-site-specific-guidelines-values>).

Another recommendation is that the national environmental standards be principles-based rather than prescriptive. For example, the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ('the JORC Code') is a professional code of practice that sets minimum standards for public reporting of Exploration Results, Mineral Resources and Ore Reserves to the ASX and is principles-based, encouraging continual improvement and transparent reporting. It has been so successful that it has been adopted in many other countries. Conversely, prescriptive approaches often require updating as new methods and information become available.

QUESTION 11: How can environmental protection and environmental restoration be best achieved together?

Should the EPBC Act have a greater focus on restoration?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) considers that the EPBC Act should have a greater focus on restoration, including of lost or impaired ecological and evolutionary processes (for example, see Davis et al. 2013)¹⁴. Firstly, restoration is much more politically palatable than regulation. It is seen as a solution to various environmental issues and seems to have universal appeal. Consequently, much more is likely to be achieved with a 'restoration focus'. Secondly, almost all of Australia's terrestrial and aquatic environments are no longer intact or near-pristine. Instead, most are in need of restoration to recover lost biodiversity and resilience, and to promote hydrological, biogeochemical and ecological and evolutionary processes that underpin the maintenance of landscape-level ecological integrity. Provisions in the Act to encourage and support effective restoration should be included, and should specify appropriate monitoring of responses of biodiversity and the environment to restoration that includes making the monitoring data publicly available.

The Act should acknowledge that environmental restoration involves adaptive management which should be implemented at the outset of any development likely to affect biodiversity and ecological and evolutionary processes. Rather than restoring impaired ecosystems sequentially by first remediating contaminants and then restoring ecological structure and function, a better approach is to plan for restoration throughout the process to avoid intrusive remediation activities that close off options for the desired restoration (Frag et al. 2016)¹⁵. Restoration goals should be realistic (e.g. not seeking pre-European status) and acknowledge constraints imposed by current and future land-uses, increasing human population densities and predicted changes in climatic conditions. Adaptive management and restoration are not always feasible (e.g. because of long lag times in responses as seen in the effects of underground mining on groundwater), and so the Act should be careful not to imply that restoration is always an option for all developments likely to have environmental impacts.

¹⁴ Davis, J.A., Pavlova, A., Thompson, R. & Sunnucks, P. (2013). Evolutionary refugia and ecological refuges: key concepts for conserving Australian arid zone freshwater biodiversity under climate change. *Global Change Biology*, 19, 1970–1984.

¹⁵ Frag, A.M., Hull, R.N., Clements, W.H., Glomb, S., Larson, D.L., Stahl, R. & Stauber, J. (2016). Restoration of impaired ecosystems: An ounce of prevention or a pound of cure? Introduction, overview, and key messages from a SETAC-SER workshop. *Integrated Environmental Assessments and Management*, 12, 247– 252.

Should the Act include incentives for proactive environmental protection?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) strongly advocates that the EPBC Act should include incentives for proactive environmental protection, along with a series of general principles to help this process. There are many examples where incentives for land managers being proactive have been highly successful in protecting valued environments and reducing the impacts of various land-uses. One of these examples is the 'Landholders Driving Change Burdekin Major Integrated Project' funded by the Queensland Government through the Queensland Reef Water Quality Program. This program focuses on incentivising landholders in the Bowen, Broken and Bogie catchments, three catchments that contribute 25% of the fine sediment discharged to the Great Barrier Reef, primarily from grazing lands. Non-financial incentives include the provision of information and support through extension and training services, as well as recognising and rewarding high performers. Financial incentives reward particular behaviours and include market-based instruments, grants and subsidies. As different incentives are favoured by different graziers, the suite of incentives is flexible and complementary. Other examples of land management where multiple and complementary incentives have proven successful in Australia include riparian revegetation programs, various 'clean energy' schemes, and the Environmental Stewardship Program.

How will we know if we're successful?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) considers that monitoring programs and a clear statement of outcomes (specifying their spatial scale and the expected time to reach them) are fundamental to assessing success, and should be recommended by the EPBC Act. All monitoring data should be made publicly available (see the IESC's response to Question 6) so that evidence for the success of proactive environmental protection can be assessed independently. Other cases of public disclosure of data have proven successful (e.g. The 'FracFocus' website managed by the US Ground Water Protection Council and Interstate Oil and Gas Compact Commission, two organizations whose missions evolve around conservation and environmental protection, and whose site provides public access to reported chemicals used for hydraulic fracturing within their local area. <http://fracfocus.org/> [Accessed 23 February 2020]).

QUESTION 13: Should the EPBC Act require the use of strategic assessments to replace case-by-case assessments? Who should lead or participate in strategic assessments?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that instead of replacing case-by-case assessments with strategic assessments, the EPBC Act should require the use of both approaches because they usually have different aims and often require different methods, models and assumptions. For example, landscape-scale issues and cumulative impacts are more likely to be best covered by strategic regional assessments. Conversely, individual cases could be potentially nested within the area covered by a strategic assessment and would be of sufficiently fine scale that more detailed environmental assessments of local biodiversity and hydrological, biogeochemical, toxicodynamic, toxicokinetic and ecological processes are possible. Assessing environmental impacts at multiple spatial (and temporal) scales yields insights into likely causal pathways and potential impacts that might not be evident from a single scale.

QUESTION 15: Should low-risk projects receive automatic approval or be exempt in some way?

- **How could data help support this approach?**
- **Should a national environmental database be developed?**
- **Should all data from environmental impact assessments be made publicly available?**

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) has major concerns about automatically approving ‘low-risk’ projects or considering them exempt from the EPBC Act in some way. Although at first sight, it seems sensible to exempt low-risk projects, much hinges on how this risk is assessed and whether there are enough data provided to support this assessment and provide sufficient context, especially for potential cumulative impacts. It would seem prudent for the Act to require that all projects need to undertake a comprehensive risk assessment supported by robust data that are made publicly available. Importantly, there must be specific provisions in the Act that seek whether the project is part of a larger development. Individual components of multiple expansions of, for example, an open-cut coal mine over several decades may appear separately to be low-risk but when the whole mine’s impacts are considered collectively, the development would pose a much higher risk. Given the limited coverage of cumulative impacts by the current Act, it is crucial that individual projects comprising multiple related or cumulative components of a larger development are not automatically approved or exempted because they appear to be of low risk when viewed singly. This same concern applies for the ‘water trigger’ when a project is being assessed for whether it will have a “significant” impact on water resources and therefore be referred to the IESC.

The IESC strongly supports the development of a national environmental database and that all data from environmental impact assessments be made publicly available (see the IESC’s response to Question 6). If submission of all data from environmental impacts to a national environmental database were stipulated in the EPBC Act, this would preclude the possibility that such a request may be missed in the environmental conditions that are subsequently set upon a project. Importantly, these collective data should be used by proponents to better address potential cumulative effects and to set realistic outcomes for ongoing restoration (see the IESC’s response to Question 11) and the final landform when the project concludes.

Substantial national environmental databases are already provided by agencies such as the Bureau of Meteorology and Geoscience Australia, and this approach needs to be extended to provide publicly available national data on ecological components (species populations, communities), ecological processes and integrity, and ecosystem services. Importantly, these data need to be derived from robust sampling designs and be checked and validated. The EPBC Act could play a key role in not only legislating for publicly available environmental and ecological data but also specifying minimum standards for data quality control and maintenance.

QUESTION 16: Should the Commonwealth’s regulatory role under the EPBC Act focus on habitat management at a landscape-scale rather than species-specific protections?

Instead of replacing species-specific protections with habitat management at a landscape scale, the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that the Commonwealth’s regulatory role under the EPBC Act should focus on both. Habitat management will often benefit a suite of species but, on its own, does not guarantee successful species-specific protection because there may be other factors unrelated to habitat (e.g. availability of a crucial food item, predation or competition from invasive species) that threaten a given species. For many species, information on their ecology is limited and so habitat management is an excellent interim strategy to help protect them. However, further work should be done to confirm the effectiveness of habitat management for each species and there may be additional strategies needed to ensure successful protection of an endangered species.

QUESTION 19: How should the EPBC Act support the engagement of Indigenous Australians in environment and heritage management?

- **How can we best engage with Indigenous Australians to best understand their needs and potential contributions?**

- **What mechanisms should be added to the Act to support the role of Indigenous Australians?**

Currently, the empirical environmental information and predicted or modelled impacts on water resources presented in environmental impact statements (EISs) and other documents provided by proponents of project proposals that are considered by the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) in its advice to regulators do not draw on traditional knowledge or other contributions of environmental information from Indigenous Australians. However, environmental scientists have long realised that there is traditional knowledge that can be highly relevant to successful management of Australia's natural resources, including protection of the environment and its biodiversity (see the IESC's response to Question 7).

In principle, the IESC strongly supports the inclusion of legislation in the EPBC Act that would encourage proponents to draw upon as wide an information base as possible, including relevant traditional knowledge from Indigenous Australians, to best inform environmental assessments and predictions of likely impacts of proposed developments. However, the Committee is also acutely aware that engaging respectfully with Indigenous Australians to share relevant environmental information involves mutual trust, reciprocal engagement and partnerships, appropriate cultural sensitivity and respect for Indigenous rights, and recognition that particular forms of traditional knowledge must be protected and cannot be widely shared. These features are a common thread in many documents about scientific engagement with Indigenous Australians (e.g. Department of the Environment, 2014¹⁶; Carroll 2017¹⁷).

It is crucial that these activities, if conducted by proponents or their consultants, are not perceived as tokenistic, do not transfer information primarily one-way, do not breach Indigenous Australians' intellectual property, and allow sufficient time for the establishment of trust, respect and reciprocal sharing of information. Although there is a shared motivation to protect biodiversity and the environment, Indigenous Australians typically perceive environmental values and dynamics differently from those espoused by 'western' science which means that traditional knowledge must be interpreted and used differently from the ways that EISs currently present and analyse data. Where possible, these interpretations must be validated by Indigenous Australians to ensure that traditional knowledge is not presented out of context in the EISs. It is logical to predict that EISs that draw on as many relevant forms of environmental information as possible will be more useful documents than those that do not, and therefore this process should be encouraged by the EPBC Act.

16 Department of the Environment (2014). National Environmental Science Programme Indigenous Engagement and Participation Strategy Guidelines v1.0. (11 pp.). Australian Government Department of the Environment, Canberra.

<http://www.environment.gov.au/system/files/pages/2f561690-b47e-4bf2-b028-d18739b3486f/files/nesp-indigenous-engagement-guidelines.pdf> [Accessed 12 March 2020].

17 Carroll, J. (2017). Indigenous knowledge: adding value to science and innovation.

https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/FlagPost/2017/November/Indigenous_Knowledge_and_Science [Accessed 18 January 2020].

QUESTION 24: What do you see are the key opportunities to improve the current system of environmental offsetting under the EPBC Act?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) acknowledges the necessity of having a system of environmental offsets under the EPBC Act to include measures to counterbalance the environmental impacts that remain after avoidance and mitigation measures (i.e. 'residual impacts'). The intention is that these offsets help to achieve long-term environmental outcomes for matters protected under the EPBC Act while providing flexibility for proponents seeking to undertake an action that will have residual impacts on those protected matters (Commonwealth of Australia 2012¹⁸, p. 9). The current policy makes useful

recommendations about the importance of habitat quality, the necessity to effectively account for and manage the risks of the offset not succeeding, and that the size and scale of the offset should be proportionate to the likely residual impacts on the protected matter. There is the assumption that there will be sufficient and suitably robust data provided to allow these aspects to be fully considered.

The current system of environmental offsetting under the EPBC Act has a strong focus on habitat protection, especially of terrestrial surface habitats. Less clear is how offsetting would be able to adequately protect ecological processes or flow-paths (e.g. groundwater flow-paths, stream or river segments) whose integrity relies heavily on being connected to recharge and discharge areas that might not fall within the area being set aside for offsetting. The IESC sees a key opportunity to improve the current system of offsetting by providing clear guidance to proponents about how they might address the adequate offsetting of such highly connected systems, if indeed it is possible. A second key opportunity is to clarify how best to deal with uncertainty when seeking to offset habitats whose dependence on groundwater is unclear yet may be a crucial determinant of the habitat's persistence. For example, in the Sydney Basin, the validity of offsets to protect coastal upland swamps is challenged by uncertainty about the relative dependency of these ecosystems on surface versus groundwater water sources as well as whether the offset swamps are actually meeting the 'no worse' or 'better' criteria. Where habitats (such as swamps) are parts of landscape- or regional-scale mosaics, adequate information is needed on ecological connectivity and the importance of other processes that extend beyond the boundaries of the potential offset area and that may govern the long-term persistence of the proposed offset. These are especially pertinent when planning to use offsets to compensate for cumulative impacts that may arise because of significant loss of equivalent habitats, for example.

The IESC commends the option of 'advanced environmental offsets' (Commonwealth of Australia 2017¹⁹) and agrees that these are generally likely to have greater conservation benefits than traditional offsets because they are established prior to any impact occurring and can be delivered more strategically (e.g. placed close to wildlife corridors). However, the same concerns about adequately assessing connectivity (hydrological, biogeochemical and ecological links that sustain the habitat or ecological process to be protected) and dealing with uncertainty still remain, and should be addressed by the Act.

¹⁸ Commonwealth of Australia (2012). Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy. Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

<http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy> [Accessed 12 March 2020].

¹⁹ Commonwealth of Australia (2017). Policy statement: Advanced environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999. Australian Government, Department of the Environment and Energy, Canberra.

<https://www.environment.gov.au/epbc/publications/policy-statement-advanced-environmental-offsets-under-epbc-act> [Accessed 12 March 2020].

QUESTION 32: Is there anything else of importance to you that you would like the review to consider? - Is there anything else of importance to you that you would like the review to consider?

Please note that the main points of this submission are shown in BOLD in the attachment.

ATTACHMENT

Additional information was provided as an attachment to this submission. The attachment is provided on the following pages of this document.

IESC submission to EPBC Act Review

Please Note:

- This Word document version has been attached because it shows formatting that isn't supported by the on-line form.
- The main points of the submission are shown in Bold.

About the EPBC Act

The EPBC Act, as Australia's central piece of national environmental law, reflects the role of the Commonwealth to address matters of national environmental significance, provide a nationally coordinated approach to managing our environment and meet our international commitments.

1. Some have argued that past changes to the EPBC Act to add new matters of national environmental significance did not go far enough. Others have argued it has extended the regulatory reach of the Commonwealth too far. What do you think?

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) is largely satisfied with the current list of Matters of National Environmental Significance (MNES) in the amended Act. However, the IESC agrees that past changes to the EPBC Act to add new MNES did not go far enough and it **strongly advocates the inclusion of a 'greenhouse trigger' to strengthen the Act's capacity to more effectively protect the planet's entire 'critical zone'**. On land, this zone extends from above the tree canopy down into the groundwater to encompass the entire boundary layer where soil, water, air and living organisms interact. Reasons for suggesting the inclusion of a 'greenhouse trigger' are discussed in more detail in the IESC's response to Question 4.*

The inclusion of the 'water trigger' as an MNES was an especially important addition for the IESC (which was formed in 2012; see Sections 505C and 505D of the EPBC Act). Before then, the most relevant MNES to the IESC were wetlands of international importance (listed under the Ramsar Convention), listed threatened species and ecological communities, listed migratory species protected under international agreements, and, potentially, the Great Barrier Reef Marine Park. In 2013, there was an amendment informally called the 'water trigger' that added a further Matter: 'a water resource in relation to coal seam gas and large coal mining'. In this amendment, 'water resource' is defined according to the Water Act 2007 as: '(a) surface water or ground water; or (b) a watercourse, lake, wetland or aquifer (whether or not it currently has water in it); and includes all aspects of the water resource (including water, organisms and other components and ecosystems that contribute to the physical state and environmental value of the water resource).'

The addition of this Matter allowed the IESC to provide Commonwealth and state regulators with much more comprehensive and integrated scientific advice that:

- (1) covered potentially impacted surface waters and groundwaters (both quantity and quality) whose catchments and/or recharge areas often span multiple states,*
- (2) addressed issues of direct community concern about potentially irreversible impacts of an industry on a limited resource, and,*
- (3) provided an holistic perspective of possible direct and indirect exposure pathways whereby activities associated with large coal mining or coal seam gas development may affect*

hydrogeological, hydrological, chemical, biogeochemical, ecotoxicological and ecological processes potentially impacting valued biota and/or ecosystem services that were not adequately covered by the other MNES.

Hunter (2017)¹ provides a detailed independent assessment of the ‘water trigger’, concluding that it has been highly successful. In particular, this assessment states that the impact of the ‘water trigger’ has been to strengthen adaptive management in a domain in which the potential impacts to water are often uncertain, occur over a long period, and carry significant risks in terms of consequences. It also asserts that the Commonwealth’s policy in setting conditions to address gaps in state assessment and regulatory decisions relative to the requirements of the ‘water trigger’ legislation has served to integrate Commonwealth and state regulatory arrangements. Another conclusion is that public confidence in the regulatory system as a whole is likely enhanced by knowing that independent expert scientific expertise is applied to consideration of potential impacts to water resources of coal seam gas and large coal mining developments and, in accordance with the intention of the legislation, has been applied directly to water as a Matter of National Environmental Significance in the setting of environmental conditions for the project to commence.

*Based on the favourable review by Hunter (2017) and the IESC’s own experience over the last seven years (including assessment of over 125 projects), the Committee suggests that **there would be substantial merit in extending the ‘water trigger’ to include developments targeting extraction of other unconventional gases** (i.e. other than coal seam gas). Benefits of this extension include:*

- (1) public concerns about the potential impacts of unconventional gas extraction on water are similar to those concerns about potential impacts of coal seam gas extraction, and may be largely allayed by the knowledge that proposals would be reviewed by independent expert scientists who would specifically consider potential impacts to water resources at multiple spatial and temporal scales,*
- (2) there is sufficient scientific expertise within the IESC that a new committee would not be required to address proposals for unconventional gas extraction (however, there would be additional resources needed for the Office of Water Science who currently provides crucial administrative and technical support to the Committee), and,*
- (3) the same advantages described in 1-3 above.*

*Further, the IESC agrees with the point raised by McCormick et al. (2013, p. 25)² that **as other forms of hard-rock mining, particularly those that excavate beneath the water table, are likely to have significant impacts on water resources, it is logical to extend the ‘water trigger’ to these activities also. However, the large number of these activities would probably require substantial resources and a second independent expert scientific committee.***

The IESC does not consider that the addition of new MNES to the EPBC Act has extended the regulatory reach of the Commonwealth too far. For example, catchments and channels of many surface water resources span multiple states, potentially complicating state-level assessment and legislation. Similarly, groundwater basins and their recharge areas often cross state borders, with discharge sometimes occurring in a different state from the recharge zone. In these situations and using the ‘water trigger’ as an example, Commonwealth oversight complements multi-state

legislation to provide effective landscape- and regional-scale management of potential impacts of coal seam gas and large coal mining development on water resources. This complementary oversight and its environmental effectiveness in protecting the 'critical zone' (i.e. beyond just water resources as currently covered under the 'water trigger') would be substantially enhanced by the addition of a 'greenhouse trigger' as a further MNES (see the IESC's response to Question 4).

¹Hunter, S. (2017). *The Independent Review of the Water Trigger Legislation*. Commonwealth of Australia, Canberra. <http://www.environment.gov.au/system/files/resources/905b3199-4586-4f65-9c03-8182492f0641/files/water-trigger-review-final.pdf> [Accessed 20 January 2020].

²McCormick, W., St John, A. & Tomaris, J. (2013). *Environment Protection and Biodiversity Conservation Amendment Bill 2013*. Bills Digest no. 108, 2012–13 (28 pp.) Parliament of Australia, Department of Parliamentary Services, Canberra. https://www.aph.gov.au/sitecore/content/Home/Parliamentary_Business/Bills_Legislation/bd/bd1213a/13bd108 [Accessed 20 January 2020].

2. How could the principle of Ecologically Sustainable Development (ESD) be better reflected in the EPBC Act? For example, could the consideration of environmental, social and economic factors, which are core components of ESD, be achieved through greater inclusion of cost benefit analysis in decision making?

Not answered

3. Should the objects of the EPBC Act be more specific?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) considers that the objects of the EPBC Act should be more specific because this will substantially assist regulators in applying the Act. For example, in the 'Significant impact guidelines 1.1' of the 'Matters of National Environmental Significance' document, "a significant impact" is defined as:

"... an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on the environment." (Department of the Environment, Water, Heritage and the Arts, 2013³, p. 3).

In this situation, assessment of 'significance' is somewhat subjective yet is essential in deciding whether or not an action is 'significant' and therefore needs referral to the Minister. It is accepted that many terms and concepts in environmental science are elusive and difficult to describe succinctly (like the example above) but making the objects of the Act more specific and having consistent definitions that apply across state and Commonwealth legislation will reduce the risk of misapplication of the EPBC Act.

Another example of the value in making the objects of the EPBC Act more specific lies in **emphasising the Act's intention to protect the environment by conserving its ecological processes** as well as its biodiversity. Currently, the Act's objects as stated in Item 3 on p1 include 'to promote the conservation of biodiversity'. However, there is no specific mention of promotion of the conservation of ecological processes or ecosystem resilience. Both of these aspects are now widely accepted by environmental scientists as being crucial to the maintenance of functional ecosystems and their capacity to withstand disturbances, including those by human activities, and the IESC suggests that they should be explicitly included in the objects of the Act. In the EPBC Act, the term 'ecological integrity' is mentioned only once (in Item 3A(d)) as a part of one of the principles of ecologically sustainable development but the term 'ecological integrity' is not defined in the Act's Definitions (Item 528).

The objects of the EPBC Act (or indeed the rest of the Act) never mention 'cumulative impacts' or 'climate change' yet both these features are now recognised as being fundamental to the effective protection of biodiversity and the environment, especially in the context of the uncertainty of their likely escalating impacts on ecological processes, environmental sustainability and ecosystem resilience. **The IESC urges that both cumulative impacts and climate change should be explicitly included in the Act**, preferably as specific components of the objects so that their central importance and relevance to Australia's environmental protection is emphasised and legislated appropriately.

³Department of the Environment, Water, Heritage and the Arts (2013). Significant Impact Guidelines 1.1 - Matters of National Environmental Significance. Australian Government, Commonwealth of Australia, Canberra. <https://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance> [Accessed 20 January 2020].

4. Should the matters of national environmental significance within the EPBC Act be changed? How?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) **strongly supports the addition of an MNES to the EPBC Act in the form of a 'greenhouse trigger'** similar to the one proposed on 16 November 2000 by the then-Minister for Environment and Heritage, Senator Robert Hill, that major new developments would trigger the EPBC Act if they were likely to result in greenhouse gas emissions of more than 0.5 million tonnes of carbon dioxide equivalent in any 12-month period

(<https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id:%22media/pressrel/67W26%22>, [accessed 21 Jan 2020]). However, the IESC considers that **there should be some latitude in the trigger value** and disagrees that a specific value like 'more than 0.5 million tonnes of carbon dioxide equivalent in any 12-month period' should be explicitly stated in the Act. This latitude would allow flexibility in assessments by the relevant Environmental Minister as to whether a given proposal would trigger the Act.

In 2000, Senator Hill claimed that the 'greenhouse trigger' process would consider environmental, economic and social factors so that effects on international competitiveness and regional development would be factored into the assessment and approval process. Further, the delivery of any net greenhouse benefits, such as those obtained by the adoption of new technology, would also be included in the assessment. Although the Coalition made a commitment in their 2001 election

policy to complete consultations on the inclusion of a greenhouse trigger in the EPBC Act, the Howard Government never proceeded with adding this 'greenhouse trigger' to the list of MNES in the EPBC Act (McCormick et al. 2013²). In passing, the IESC notes that Recommendation 10 of the Hawke (2009⁴) review of the EPBC Act also suggested an interim greenhouse trigger, with a threshold of at most 500,000 tonnes of carbon dioxide equivalent emissions, be introduced as soon as possible until the commencement of a Carbon Pollution Reduction Scheme; and that the Act be amended to insert a requirement to consider cost-effective climate change mitigation opportunities as part of strategic assessments and bioregional planning processes.

The main reason that the IESC strongly supports this 'greenhouse trigger' is that its inclusion will greatly strengthen the Act's capacity to more effectively protect the planet's entire 'critical zone'. This zone, which on land extends from above the tree canopy down into the groundwater, encompasses the boundary layer where soil, water, air and living organisms interact. These complex interactions, among other roles, regulate conditions and processes in the natural habitat, sustain biodiversity, and support the provision of life-sustaining resources (e.g. food and water) and other ecosystem services critical to human existence. The 'greenhouse trigger' would complement the protection to water resources afforded by the 'water trigger' and ensure that the full range of potential impacts of a project could be evaluated holistically, including those that may affect atmospheric conditions and air quality.

A second reason is because of the overwhelming scientific evidence that the climatic extremes and higher average air temperatures experienced across much of Australia in the last decade are due, in part, to anthropogenic greenhouse gas emissions. The social and economic toll of these extreme climatic conditions (e.g. prolonged drought, severe bushfires) is enormous. An amendment to add a 'greenhouse trigger' would include assessment of how best to reduce this impact and help Australia meet its international responsibilities in a cost-effective way. An independent and trusted committee of scientific experts could be involved in the assessment of projects under such a 'greenhouse trigger', emulating the highly successful model of IESC involvement in the current 'water trigger' process.

²McCormick, W., St John, A. & Tomaris, J. (2013). *Environment Protection and Biodiversity Conservation Amendment Bill 2013. Bills Digest no. 108, 2012–13 (28 pp.)* Parliament of Australia, Department of Parliamentary Services, Canberra.
https://www.aph.gov.au/sitecore/content/Home/Parliamentary_Business/Bills_Legislation/bd/bd1213a/13bd108 [Accessed 20 January 2020].

⁴Hawke, A. (2009). *The Australian Environment Act – Report of the Independent Review of the Environment Protection and Biodiversity Conservation Act 1999.* Australian Government Department of the Environment, Water, Heritage and the Arts, Canberra.
<https://www.environment.gov.au/legislation/environment-protection-and-biodiversity-conservation-act/epbc-review-2008> [Accessed 18 January 2020].

5. Which elements of the EPBC Act should be priorities for reform? For example, should future reforms focus on assessment and approval processes or on biodiversity conservation? Should the Act have proactive mechanisms to enable landholders to protect matters of national environmental significance and biodiversity, removing the need for regulation in the right circumstances?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that one priority for reform should be **a greater focus on protecting hydrological, biogeochemical, ecological and evolutionary processes** (e.g. groundwater flux, surface water flows, ecological connectivity, biogeochemical pathways of nutrients) **at large spatial scales** (landscapes, regions and nationally) **over commensurate timescales** (e.g. decades, centuries) to complement the emphasis in the current Act on biodiversity conservation. Although the Act acknowledges the importance of these broader spatial and temporal scales, it was drafted at a time when technological tools such as remote sensing methods and large data storage and retrieval platforms (including the Web) were in their infancy. Further, in the last two decades there has been greater scientific recognition of the fundamental importance of landscape-scale ecological processes and connectivity, legacy effects and nonlinear cumulative effects, and this enhanced understanding needs to be specifically encapsulated in the Act.

The IESC suggests that a second priority for reform (relevant to the environmental assessment and approvals process) is the need for **a focus on outcomes-based assessments**. These **outcomes must be clearly stated, measurable, realistic, achievable, adequately resourced and placed into a temporal context that dictates periods of time after which one or more outcomes will be achieved**.

Currently, many outcomes predicted in environmental impact assessments are aspirational, equivocal and generic, and seldom accompanied by measurable indicators and time scales. Further, outcomes-based assessments must also be complemented with comprehensive risk analyses. The importance of comprehensive risk analysis is emphasised in the IESC's Information Guidelines for proponents of large coal mines or coal seam gas development (available at <http://www.iesc.environment.gov.au/information-guidelines>), along with specific supplementary Explanatory Notes on topics such as uncertainty analysis in groundwater modelling. Explicitly addressing sources of uncertainty in all outcomes-based assessments should be specified in the Act because of the challenges of evaluating these sources against a background of immense inherent spatial heterogeneity and increasing climatic variability. For example, if a proponent for a major development claims that a certain landscape (including surface and subsurface waters) will eventuate after a given activity for a given period of time, convincing evidence must be presented showing causal pathways and mechanisms by which such an outcome will be achieved. Monitoring to demonstrate progress towards this outcome and then its persistence is essential.

Although assessment and approval processes are important, it is equally crucial to have credible management plans and scientific evidence demonstrating how such processes will achieve a desired and agreed outcome, as specified in a reformed EPBC Act. Methods to avoid, mitigate or manage risks (including cumulative ones) that were identified in the initial environmental impact assessment should be explicitly addressed in these management plans. These plans could then be reviewed by an independent panel of expert scientists to determine whether the measures to reduce impacts on biodiversity and ecological integrity are adequate and whether potential sources of uncertainty and other risks have been fully considered.

A third priority for reform of the EPBC Act that the IESC advocates is the **encouragement of proactive measures to enable landholders to protect MNES and biodiversity**. Measures that help address cumulative impacts at landscape and regional scales should be especially encouraged. In particular, the IESC suggests that the Act should specifically encourage collaboration among companies and members of a particular industry to help provide and carry out effective and integrated management

plans and monitoring programs that produce a desired landscape-scale outcome and reduce collective impacts, especially along river systems or groundwater flowpaths.

Although the IESC agrees that the Act should have proactive mechanisms to enable landholders to protect matters of national environmental significance and biodiversity, the Committee still sees a need for regulation to (a) complement the landholders' actions in case they are insufficient to adequately protect environmental assets and (b) ensure a framework for monitoring the effectiveness of the mechanisms is in place. Design and application of a suitable monitoring framework (including sampling and data storage, analysis and interpretation) are crucial in outcomes-based assessments to ensure that outcomes are achieved in the stated time frames and that where necessary, changes can be made to the management of the environment in response to changing conditions and activities (i.e. adaptive environmental management).

6. What high level concerns should the review focus on?

From direct experience through its activities supported by the EPBC Act, the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests four high-level concerns that it considers would be relevant to the review and where the Act should play a stronger role:

- (1) **A mandate that all data collected for environmental projects** (from application to post-project monitoring) **should be housed in a centrally coordinated, comprehensive, adequately resourced and regularly updated national environmental database that is publicly accessible and searchable;***
- (2) **Explicit inclusion of and guidance about the protection of ecological and evolutionary processes that contribute to sustaining the integrity of ecosystems and communities,** including supporting their ecosystem services;*
- (3) **Legislative support and guidance for landscape-, regional- and national-scale assessments of (a) subsurface waters, (b) long-term changes against a backdrop of predicted climatic change, and (c) cumulative impacts** whose causes and results may not be simply additive but change dramatically when a threshold is exceeded; and,*
- (4) **Recommendations for greater use of independent scientific expert panels to improve the consistency and quality of the environmental assessments** of industries whose activities may have local and landscape-level repercussions and affect biodiversity and ecological processes.*

Each of these concerns is discussed in more detail below.

Currently, much of the data gathered for various stages (e.g. initial environmental impact assessments, monitoring required by environmental conditions of consent) of developments that may have impacts on biodiversity and the environment is not publicly accessible nor is it stored in a central national database. These data typically comprise site-specific information on groundwater levels and water quality, surface water dynamics and physicochemistry, soil parameters, and survey data for flora and fauna, and are often collected repeatedly over time from reference and impacted sites. In general, collecting empirical data is expensive and time-consuming but the information is crucial for numerous applications, including bioregional assessments, baseline surveys and testing the predictions of hydrological and ecological cause-effect models. However, seldom are these data

made available for public access nor is the information stored in a centrally coordinated, comprehensive, adequately resourced and regularly updated national environmental database. If the EPBC Act legislated that all environmental data collected to support development proposals and monitor their potential impacts must be placed on a national environmental database that is publicly accessible, then the value of these data would be far greater in enhancing protection of biodiversity and the environment. Already, there are some platforms where such data could be stored (e.g. Atlas of Living Australia [www.ala.org.au]) and these could either be linked to other national databases and mapping tools (e.g. Google Earth) or supplemented with dedicated databases that include concurrent environmental information. Although approvals for many developments include conditions that stipulate environmental monitoring data should be collected, these conditions seldom specify that the information should be entered into a central and publicly accessible database.

In keeping with its objects, the EPBC Act should explicitly specify the need to protect ecological and evolutionary processes that contribute to sustaining the integrity of ecosystems and communities, including supporting their ecosystem services. In addition, the Act should include practical guidance to proponents of project proposals about how to protect these processes and how to monitor the effectiveness of proposed protective measures. Currently, almost all of the ecological focus in environmental impact assessments is on specific individual species and communities, usually only those that are listed as threatened, endangered or vulnerable. However, the ecological and evolutionary processes that sustain the species and their habitats and/or that provide crucial ecosystem services may not be adequately protected or even monitored. In many cases, these processes are poorly known. However, the IESC notes that when cause-effect pathways are conceptually modelled to identify potential impacts of a given development, the loss or impairment of one or more ecological processes usually underpins an important impact pathway and often involves disruption of hydrological, biogeochemical or ecological connectivity in an ecosystem. The objects of the EPBC Act would be strengthened considerably by specific inclusion of protection of ecological and evolutionary processes to complement the protection of biodiversity and listed species, communities and ecosystems.

The IESC considers that the EPBC Act should include legislative support and practical guidance for landscape-, regional- and national-scale assessments of subsurface waters to complement equivalent assessments of surface assets, and to provide a collective baseline context for individual developments. Technological tools such as remote sensing are powerful ways of mapping surface resources at landscape, regional and national scales but are far less effective for mapping subsurface waters at large spatial scales. The EPBC Act should also legislate for better assessment of potential long-term changes against a backdrop of predicted climatic change because many environmental impact assessments where the effects are predicted to persist for decades fail to consider such changes adequately. A third high-level concern also operating at large spatial and temporal scales is the appropriate assessment of cumulative impacts, especially in situations when causes and results may not be simply additive but change dramatically when a threshold is exceeded. The Committee urges specific addition of legislation in the Act that specifies the need to assess potential impacts of a proposed development on biodiversity and the environment at appropriately large spatial and temporal scales, includes analysis of long-term changes against a backdrop of predicted climate change, and explicitly models potential cumulative impacts given previous, present and likely future activities in the area.

Where particular activities or developments are likely to have major, widespread and/or persistent impacts (e.g. contaminated groundwater or soil, poor air quality), then independent scientific expert panels like the IESC are likely to substantially improve the quality and consistency of environmental assessments. This is especially true where the potential consequences of a given activity or development are of great community concern. Over the past seven years of assessing over 125 proposals for coal seam gas and large coal mining developments, the IESC has been able to provide Commonwealth and state regulators with comprehensive and integrated scientific advice that has improved the protection of biodiversity and the environment while still enabling economic extraction of natural resources. Feedback to the IESC from regulators, the mining industry and community stakeholders has been positive because all players respect the independence and quality of the science underpinning the advice from the IESC. The Committee is not a regulator and does not decide whether or not a project should occur. However, it is able to provide an holistic perspective of possible direct and indirect exposure pathways whereby activities associated with large coal mining or coal seam gas development may affect hydrogeological, hydrological, chemical, biogeochemical, ecotoxicological and ecological processes potentially impacting valued biota and/or ecosystem services. In addition, the IESC (supported by the Office of Water Science) also oversees relevant research and provides 'explanatory notes' and other guidance to address information gaps to improve the environmental assessment process. These roles, performed by a suitably qualified panel of independent scientific experts, could be performed by equivalent committees and legislated under the Act for activities and industries whose impacts on biodiversity and the environment are likely to be major, widespread and/or persistent and that are of great community concern.

For example, should there be greater focus on better guidance on the EPBC Act, including clear environmental standards?

The IESC does not consider that providing clear environmental standards in the EPBC Act would be especially useful because in many cases, environmental standards and guideline values are place- and time-specific, and therefore could not be readily summarised in a national Act (except as guiding principles). Further, many environmental standards and values (e.g. water and sediment quality guidelines) are being continually revised as new scientific information is obtained which would mean that the guidance in the Act might quickly become out-dated and potentially unreliable.

How effective has the EPBC Act been in achieving its statutory objectives to protect the environment and promote ecologically sustainable development and biodiversity conservation?

Not answered

What have been the economic costs associated with the operation and administration of the EPBC Act?

Not answered

3. What the future looks like

As independent reviews of the EPBC Act occur once each decade, it is important that this independent review ensures its recommendations are fit for the future.

7. What additional future trends or supporting evidence should be drawn on to inform the review?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) agrees strongly with the sentiment that recommendations from this independent review should be fit for the future, and suggests that the review would benefit from information on future trends (1) in surface and groundwater levels and water quality nationally, (2) on how groundwater-dependent ecosystems are expected to vary in distribution and composition (in response to, for example, climate change and altered water/land use), and (3) on how groundwater flux (especially in northern Australia and around the margins of the Great Artesian Basin) might change over time.

However, the IESC notes with concern that almost one billion dollars (\$872M in 2010) of national groundwater monitoring infrastructure is in a state of decline, with half of it predicted to be non-operational by 2034 and all of it defunct by 2062 (Sinclair Knight Merz 2012⁵). Without these national monitoring bores providing reliable data on what is arguably one of Australia's most important freshwater resources, assessing the success or otherwise of the EPBC Act in protecting ecological processes and biodiversity of groundwaters and their dependent ecosystems is impossible. There seems to be no national strategy for addressing this important issue yet this information is needed for revision of legislation and guidelines to protect groundwater quality, biodiversity and ecological integrity to the same extent as surface waters.

There are many useful sources of supporting evidence that could provide information on environmental trends and to predict future trajectories in situations with limited spatial and temporal field data. One example is the use of nationally available remotely sensed Water Observations from Space (WOfS) dating back to 1987 to cost-effectively re-create historic records of surface water regimes of many more groundwater-dependent wetlands in South East South Australia than could be feasibly monitored manually (Harding et al. 2018)⁶. Integrating these derived water regimes with data from digital elevation models of basin bathymetries ascertained using light detection and ranging (LiDAR) yielded 30-year trends in surface water expression in areas where groundwater levels have changed in response to rainfall variability and groundwater extraction and interception.

Over the last decade, there has been a rapid increase in the availability, efficiency and effectiveness of tools and approaches to surveying biodiversity and ecological processes that can now be used to improve environmental decision-making (Pimm et al. 2015)⁷. These include transformative technological advances for studying species and their environments (Allan et al. 2018)⁸ and molecular methods, such as eDNA metabarcoding, that enable rapid assessment of biological diversity from the DNA found in diverse sources including soil and water (Deiner et al. 2017)⁹.

Another important source of supporting evidence is information derived from Indigenous knowledge. Such information has already contributed greatly to decision-making in water management in Australia (e.g. Leidloff et al. 2013¹⁰; Jackson et al. 2015¹¹). This rich source of knowledge can powerfully augment the discrete observations in space and time that typically support water and ecological management because Indigenous knowledge extends over very long time periods and can

integrate traditional knowledge about hydroecological responses over that time. Currently, this knowledge is accessed via combinations of archaeological, anthropological and sociological means (e.g. legends, place names and oral histories) to provide observations linking water use and the responses of aquatic ecosystems (Woodward et al. 2012)¹². In environmental impact assessments, such observations could be used to inform water models and provide constraints on the uncertainties associated with the setting of water and land allocation limits (e.g. Fassnacht et al. 2018)¹³.

⁵Sinclair Knight Merz (2012). *An assessment of groundwater management and monitoring costs in Australia*. Waterlines Report 90, National Water Commission, Canberra.

⁶Harding, C., Herpich, D. & Cranswick, R. H. (2018). *Examining temporal and spatial changes in surface water hydrology of groundwater dependent ecosystems using WOfS (Water Observations from Space): southern Border Groundwaters Agreement area, South East South Australia, DEW Technical report 2018/08, Government of South Australia, Department for Environment and Water, Adelaide.*

<http://www.waterconnect.sa.gov.au/Content/Publications/DEW/Temporal%20changes%20in%20wetland%20hydrology%20using%20WOfS.pdf> [Accessed 11 March 2020].

⁷Pimm, S.L., Alibhai, S., Bergl, R., Dehgan, A., Giri, C., Jewell, Z., Joppa, L., Kays, R. & Loarie, S. (2015). *Emerging technologies to conserve biodiversity*. *Trends in Ecology & Evolution*, 30, 685–696.

⁸Allan, B.M., Nimmo, D.G., Ierodiaconou, D., VanDerWal, J., Koh, L.P. & Ritchie, E.G. (2018.) *Futurecasting ecological research: the rise of technoecology*. *Ecosphere*, 9(5), e02163. 10.1002/ecs2.2163

⁹Deiner, K., Bik, H.M., Mächler, E., Seymour, M., Lacoursière-Roussel, A., Altermatt, F., Creer, S., Bista, I., Lodge, D.M., de Vere, N., Pfrender, M.E. & Bernatchez, L. (2017). *Environmental DNA metabarcoding: Transforming how we survey animal and plant communities*. *Molecular Ecology*, 26, 5872–5895.

¹⁰Liedloff, A.C., Woodward, E.L., Harrington, G.A. & Jackson, S. (2013). *Integrating indigenous ecological and scientific hydro-geological knowledge using a Bayesian network in the context of water resource development*. *Journal of Hydrology*, 499, 177–187.

¹¹Jackson, S., Pollino, C., Maclean, K., Bark, R. & Moggridge, B. (2015) *Meeting Indigenous peoples' objectives in environmental flow assessments: Case studies from an Australian multi-jurisdictional water sharing initiative*. *Journal of Hydrology*, 522, 141–51.

¹²Woodward, E., Jackson, S., Finn, M. & Marrfurra McTaggart, P. (2012). *Utilising Indigenous seasonal knowledge to understand aquatic resource use and inform water resource management in northern Australia*. *Ecological Management and Restoration*, 13, 58–64.

¹³Fassnacht, S.R., Allegretti, A.M., Venable, N.B.H., Fernández-Giménez, M.E., Tumenjargal, S., Kappas, M., Laituri, M.J., Batbuyan, B. & Pfohl, A.K.D. (2018). *Merging Indigenous knowledge systems and station observations to estimate the uncertainty of precipitation change in central Mongolia*. *Hydrology*, 5, Article 46.

4.A. The role of the EPBC Act

There are concerns the EPBC Act has not done enough to protect the environment. Business and government at all levels are impacted by environmental regulation of activities. This regulation is resulting in unnecessary uncertainty and delays with flow on impacts to industry, governments and the community. The review provides the opportunity to modernise national environmental law to improve outcomes for industry and the environment both now and in the future.

8. Should the EPBC Act regulate environmental and heritage outcomes instead of managing prescriptive processes?

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that **the EPBC Act should do both: regulate environmental and heritage outcomes and, to assist the achievement of these outcomes, provide and manage relevant prescriptive processes**. As advocated in its response to Question 5, the IESC strongly supports the inclusion within the EPBC Act of explicit regulation to achieve desired and clearly specified outcomes at suitably broad spatial and temporal scales. The Committee is not qualified to comment on heritage outcomes but would see the environmental outcomes as being ones where biodiversity, ecological integrity, resilience and self-sustaining ecological processes are enhanced or at least conserved. The Act may wish to phrase some of these environmental outcomes in terms of providing direct and indirect ecosystem services for use in appropriately comprehensive cost-benefit analyses so that decision-making is strategic, holistic and integrated (see the IESC's response to Question 2).*

Regulation of these outcomes should explicitly consider cumulative impacts (so that the Act is not restricted on a case-by-case application) and should specify whose responsibility it is to predict and manage these impacts (especially in situations where companies may be concerned about commercial-in-confidence data). Further, regulation of outcomes should consider the appropriateness and validity of offsetting mechanisms. For many water resources, there is considerable debate about whether 'like for like' offsets are able to address dependence of the offset on surface water and/or groundwater. For example, in the Sydney Basin, the validity of offsets to protect coastal upland swamps is challenged by uncertainty about the relative dependency of these ecosystems on surface versus groundwater water sources and also whether the offset swamps are actually meeting the 'no worse' or 'better' criteria. The EPBC Act's regulation of environmental outcomes should specify how the appropriateness of offsets will be validated when cumulative impacts are being assessed in areas where there is a shortage of suitable candidate ecosystems as 'replacements'.

4.B. Better environment and heritage outcomes

The objects of the EPBC Act reflect an ambition to unite biodiversity and heritage conservation with sustainable development principles, and to promote the conservation and sustainable use of natural resources. While states and territories have primary responsibility for land use planning and

management of environmental matters within their borders, the Commonwealth has responsibility for matters of national or international significance, as well as its own actions and its own land.

9. Should the EPBC Act position the Commonwealth to take a stronger role in delivering environmental and heritage outcomes in our federated system? Who should articulate outcomes? Who should provide oversight of the outcomes? How do we know if outcomes are being achieved?

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) strongly recommends that the EPBC Act should **position the Commonwealth to be able to take a stronger role in delivering environmental outcomes in our federated system**, especially given the disturbing trends in most environmental parameters over the last two decades. Together, the Australian Government and the state and territory governments should articulate the outcomes to provide clear guidance for application of the Act. Outcomes vary from the conservation of a given ecosystem, plant association or water resource capable of persisting and carrying out natural ecological processes through to landscape- and regional-level outcomes of mosaics of interacting surface and subsurface ecosystems that have particular desired features and values. An outcome might also be the maintenance of a given hydrological, biogeochemical or ecological or evolutionary process that provides one or more ecosystem services. Currently, the EPBC Act does not seem to be very clear about what an 'outcome' is so that is why clearer articulation and definition are both needed.*

In light of the national scale of many of the likely environmental outcomes and their drivers, the IESC reasons that it is logical that the Australian Government should provide oversight of these outcomes. This oversight should be in close collaboration with relevant state and territory governments to encourage initiatives such as on-ground management and protection, local monitoring of activities (potentially involving citizen scientists), and appropriate community consultation and support.

The achievement of these outcomes would be demonstrable through analysis of robust monitoring data, much of which should be collected nationally and using comparable and reliable sampling methods. The IESC has concerns that some national monitoring infrastructure is deteriorating rapidly (e.g. Australia's groundwater monitoring network; see IESC's response to Question 7) and requires strategic replacement and maintenance so that trends in environmental parameters and outcomes can be monitored. Where development projects are proposed, the EPBC Act should specify that environmental data before, during and after the project are collected and used by the proponent to show the successful achievement of the desired outcome. The Act should also specify that all these data should be made publicly available. Conceptual models of causal pathways and processes (e.g. hydrological, biogeochemical, ecological) that result in the achievement and persistence of a desired outcome would also be valuable in helping demonstrate that the outcomes are being achieved. Finally, there should be some mutually agreed assessment endpoints (with unambiguous measurement endpoints) that would satisfy legislative and community concerns that the outcomes were achieved and continue to be so.

10. Should there be a greater role for national environmental standards in achieving the outcomes the EPBC Act seeks to achieve?

In our federated system should they be prescribed through: Non-binding policy and strategies? Expansion of targeted standards, similar to the approach to site contamination under the National Environment Protection Council, or water quality in the Great Barrier Reef catchments? The development of broad environmental standards with the Commonwealth taking a monitoring and assurance role? Does the information exist to do this?

Not answered

Should there be a greater role for national environmental standards in achieving the outcomes the EPBC Act aims to deliver?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) believes there should be a greater role for national environmental standards in achieving the outcomes the EPBC Act but does not suggest that prescriptive standards should be specified within the Act itself (see IESC's response to Question 6). Instead, the Committee advocates that the Act should refer to guidelines to support the intent of the Act so that these guidelines can be readily updated as the need arises. Further, as many prescriptive standards are context-dependent and site-specific, national standards may have only limited value. For example, the IESC recommends that proponents of large coal mining and coal seam gas developments should use site-specific guidelines and has published an Explanatory Note describing how to do this ('Deriving site-specific guideline values for physico-chemical parameters and toxicants', <http://www.iesc.environment.gov.au/publications/information-guidelines-explanatory-note-deriving-site-specific-guidelines-values>).

Another recommendation is that the national environmental standards be principles-based rather than prescriptive. For example, the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ('the JORC Code') is a professional code of practice that sets minimum standards for public reporting of Exploration Results, Mineral Resources and Ore Reserves to the ASX and is principles-based, encouraging continual improvement and transparent reporting. It has been so successful that it has been adopted in many other countries. Conversely, prescriptive approaches often require updating as new methods and information become available.

11. How can environmental protection and environmental restoration be best achieved together?

Should the EPBC Act have a greater focus on restoration?

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) considers that the EPBC Act **should have a greater focus on restoration, including of lost or impaired ecological and evolutionary processes** (for example, see Davis et al. 2013)¹⁴. Firstly, restoration is much more politically palatable than regulation. It is seen as a solution to various environmental issues and seems to have universal appeal. Consequently, much more is likely to be achieved with a 'restoration focus'. Secondly, almost all of Australia's terrestrial and aquatic environments are no longer intact or near-pristine. Instead, most are in need of restoration to recover lost biodiversity and resilience, and to promote hydrological, biogeochemical and ecological and evolutionary processes that underpin the maintenance of landscape-level ecological integrity. Provisions in the Act to encourage and support effective restoration should be included, and should*

specify appropriate monitoring of responses of biodiversity and the environment to restoration that includes making the monitoring data publicly available.

The Act should acknowledge that environmental restoration involves adaptive management which should be implemented at the outset of any development likely to affect biodiversity and ecological and evolutionary processes. Rather than restoring impaired ecosystems sequentially by first remediating contaminants and then restoring ecological structure and function, a better approach is to plan for restoration throughout the process to avoid intrusive remediation activities that close off options for the desired restoration (Farag et al. 2016¹⁵). Restoration goals should be realistic (e.g. not seeking pre-European status) and acknowledge constraints imposed by current and future land-uses, increasing human population densities and predicted changes in climatic conditions. Adaptive management and restoration are not always feasible (e.g. because of long lag times in responses as seen in the effects of underground mining on groundwater), and so the Act should be careful not to imply that restoration is always an option for all developments likely to have environmental impacts.

¹⁴Davis, J.A., Pavlova, A., Thompson, R. & Sunnucks, P. (2013). Evolutionary refugia and ecological refuges: key concepts for conserving Australian arid zone freshwater biodiversity under climate change. *Global Change Biology*, 19, 1970–1984.

¹⁵Farag, A.M., Hull, R.N., Clements, W.H., Glomb, S., Larson, D.L., Stahl, R. & Stauber, J. (2016). Restoration of impaired ecosystems: An ounce of prevention or a pound of cure? Introduction, overview, and key messages from a SETAC-SER workshop. *Integrated Environmental Assessments and Management*, 12, 247– 252.

Should the Act include incentives for proactive environmental protection?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) strongly advocates that the EPBC Act should include incentives for proactive environmental protection, along with a series of general principles to help this process. There are many examples where incentives for land managers being proactive have been highly successful in protecting valued environments and reducing the impacts of various land-uses. One of these examples is the ‘Landholders Driving Change Burdekin Major Integrated Project’ funded by the Queensland Government through the Queensland Reef Water Quality Program. This program focuses on incentivising landholders in the Bowen, Broken and Bogie catchments, three catchments that contribute 25% of the fine sediment discharged to the Great Barrier Reef, primarily from grazing lands. Non-financial incentives include the provision of information and support through extension and training services, as well as recognising and rewarding high performers. Financial incentives reward particular behaviours and include market-based instruments, grants and subsidies. As different incentives are favoured by different graziers, the suite of incentives is flexible and complementary. Other examples of land management where multiple and complementary incentives have proven successful in Australia include riparian revegetation programs, various ‘clean energy’ schemes, and the Environmental Stewardship Program.

How will we know if we're successful?

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) considers that **monitoring programs and a clear statement of outcomes** (specifying their spatial scale and the expected time to reach them) **are fundamental to assessing success, and should be recommended by the EPBC Act**. All monitoring data should be made publicly available (see the IESC's response to Question 6) so that evidence for the success of proactive environmental protection can be assessed independently. Other cases of public disclosure of data have proven successful (e.g. The 'FracFocus' website managed by the US Ground Water Protection Council and Interstate Oil and Gas Compact Commission, two organizations whose missions evolve around conservation and environmental protection, and whose site provides public access to reported chemicals used for hydraulic fracturing within their local area. <http://fracfocus.org/> [Accessed 23 February 2020]).*

How should Indigenous land management practices be incorporated?

Not answered

How can environmental protection and environmental restoration be best achieved together?

Not answered

12. Are heritage management plans and associated incentives sensible mechanisms to improve? How can the EPBC Act adequately represent Indigenous culturally important places? Should protection and management be place-based instead of values based?

Not answered

4.C. More efficient and effective regulation and administration

Improving the efficiency and effectiveness of regulation through changes to the Act or its implementation can deliver benefit to both the economy and environment. This may reduce the regulatory costs to businesses and the broader community. It may also improve environmental outcomes, particularly if changes facilitate greater compliance with the law or improve the focus of regulation toward areas of the greatest environmental benefit.

13. Should the EPBC Act require the use of strategic assessments to replace case-by-case assessments? Who should lead or participate in strategic assessments?

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that **instead of replacing case-by-case assessments with strategic assessments, the EPBC Act should require the use of both approaches because they usually have different aims and***

often require different methods, models and assumptions. For example, landscape-scale issues and cumulative impacts are more likely to be best covered by strategic regional assessments. Conversely, individual cases could be potentially nested within the area covered by a strategic assessment and would be of sufficiently fine scale that more detailed environmental assessments of local biodiversity and hydrological, biogeochemical, toxicodynamic, toxicokinetic and ecological processes are possible. Assessing environmental impacts at multiple spatial (and temporal) scales yields insights into likely causal pathways and potential impacts that might not be evident from a single scale.

14. Should the matters of national significance be refined to remove duplication of responsibilities between different levels of government? Should states be delegated to deliver EPBC Act outcomes subject to national standards?

Not answered

15. Should low-risk projects receive automatic approval or be exempt in some way? How could data help support this approach? Should a national environmental database be developed? Should all data from environmental impact assessments be made publicly available?

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) has **major concerns about automatically approving ‘low-risk’ projects or considering them exempt from the EPBC Act in some way.** Although at first sight, it seems sensible to exempt low-risk projects, much hinges on how this risk is assessed and whether there are enough data provided to support this assessment and provide sufficient context, especially for potential cumulative impacts. It would seem prudent for the Act to require that all projects need to undertake a comprehensive risk assessment supported by robust data that are made publicly available. Importantly, there must be specific provisions in the Act that seek whether the project is part of a larger development. Individual components of multiple expansions of, for example, an open-cut coal mine over several decades may appear separately to be low-risk but when the whole mine’s impacts are considered collectively, the development would pose a much higher risk. Given the limited coverage of cumulative impacts by the current Act, it is crucial that individual projects comprising multiple related or cumulative components of a larger development are not automatically approved or exempted because they appear to be of low risk when viewed singly. This same concern applies for the ‘water trigger’ when a project is being assessed for whether it will have a “significant” impact on water resources and therefore be referred to the IESC.*

*The IESC **strongly supports the development of a national environmental database and that all data from environmental impact assessments be made publicly available** (see the IESC’s response to Question 6). If submission of all data from environmental impacts to a national environmental database were stipulated in the EPBC Act, this would preclude the possibility that such a request may be missed in the environmental conditions that are subsequently set upon a project. Importantly, these collective data should be used by proponents to better address potential cumulative effects and to set realistic outcomes for ongoing restoration (see the IESC’s response to Question 11) and the final landform when the project concludes.*

Substantial national environmental databases are already provided by agencies such as the Bureau of Meteorology and Geoscience Australia, and this approach needs to be extended to provide publicly available national data on ecological components (species populations, communities), ecological processes and integrity, and ecosystem services. Importantly, these data need to be derived from robust sampling designs and be checked and validated. The EPBC Act could play a key role in not only legislating for publicly available environmental and ecological data but also specifying minimum standards for data quality control and maintenance.

16. Should the Commonwealth's regulatory role under the EPBC Act focus on habitat management at a landscape-scale rather than species-specific protections?

Instead of replacing species-specific protections with habitat management at a landscape scale, the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) suggests that the Commonwealth's regulatory role under the EPBC Act should focus on both. Habitat management will often benefit a suite of species but, on its own, does not guarantee successful species-specific protection because there may be other factors unrelated to habitat (e.g. availability of a crucial food item, predation or competition from invasive species) that threaten a given species. For many species, information on their ecology is limited and so habitat management is an excellent interim strategy to help protect them. However, further work should be done to confirm the effectiveness of habitat management for each species and there may be additional strategies needed to ensure successful protection of an endangered species.

17. Should the EPBC Act be amended to enable broader accreditation of state and territory, local and other processes?

Not answered

18. Are there adequate incentives to give the community confidence in self-regulation?

Not answered

4.D. Indigenous Australians' knowledge and experience

Indigenous Australians are the custodians of the oldest continuous culture in the world. Over tens of thousands of years, they have built a deep connection with Country. This connection is central to their culture, spirituality, language and wellbeing. The active management of the environment and associated cultural practices by Indigenous Australians have significantly shaped the natural environment of Australia.

19. How should the EPBC Act support the engagement of Indigenous Australians in environment and heritage management?

Not answered

How can we best engage with Indigenous Australians to best understand their needs and potential contributions?

Currently, the empirical environmental information and predicted or modelled impacts on water resources presented in environmental impact statements (EISs) and other documents provided by proponents of project proposals that are considered by the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) in its advice to regulators do not draw on traditional knowledge or other contributions of environmental information from Indigenous Australians. However, environmental scientists have long realised that there is traditional knowledge that can be highly relevant to successful management of Australia's natural resources, including protection of the environment and its biodiversity (see the IESC's response to Question 7).

*In principle, the IESC **strongly supports the inclusion of legislation in the EPBC Act that would encourage proponents to draw upon as wide an information base as possible, including relevant traditional knowledge from Indigenous Australians**, to best inform environmental assessments and predictions of likely impacts of proposed developments. However, the Committee is also acutely aware that **engaging respectfully with Indigenous Australians to share relevant environmental information involves mutual trust, reciprocal engagement and partnerships, appropriate cultural sensitivity and respect for Indigenous rights, and recognition that particular forms of traditional knowledge must be protected and cannot be widely shared**. These features are a common thread in many documents about scientific engagement with Indigenous Australians (e.g. Department of the Environment, 2014¹⁶; Carroll 2017¹⁷).*

It is crucial that these activities, if conducted by proponents or their consultants, are not perceived as tokenistic, do not transfer information primarily one-way, do not breach Indigenous Australians' intellectual property, and allow sufficient time for the establishment of trust, respect and reciprocal sharing of information. Although there is a shared motivation to protect biodiversity and the environment, Indigenous Australians typically perceive environmental values and dynamics differently from those espoused by 'western' science which means that traditional knowledge must be interpreted and used differently from the ways that EISs currently present and analyse data. Where possible, these interpretations must be validated by Indigenous Australians to ensure that traditional knowledge is not presented out of context in the EISs. It is logical to predict that EISs that draw on as many relevant forms of environmental information as possible will be more useful documents than those that do not, and therefore this process should be encouraged by the EPBC Act.

¹⁶Department of the Environment (2014). National Environmental Science Programme Indigenous Engagement and Participation Strategy Guidelines v1.0. (11 pp.). Australian Government Department of the Environment, Canberra. <http://www.environment.gov.au/system/files/pages/2f561690-b47e-4bf2-b028-d18739b3486f/files/nesp-indigenous-engagement-guidelines.pdf> [Accessed 12 March 2020].

¹⁷Carroll, J. (2017). *Indigenous knowledge: adding value to science and innovation*.

https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/Fla qPost/2017/November/Indigenous_Knowledge_and_Science [Accessed 18 January 2020].

What mechanisms should be added to the Act to support the role of Indigenous Australians?

Not answered

4.E. Community inclusion, trust and transparency

Australia's environment is a valuable asset. Greater inclusion of Australians in the processes that protect, manage and promote the environment and heritage may help foster the best environmental outcomes for all Australians. Greater inclusion also facilitates transparency in decision making and fosters community trust in regulators and regulatory outcomes.

20. How should community involvement in decision-making under the EPBC Act be improved? For example, should community representation in environmental advisory and decision making bodies be increased?

Not answered

21. What is the priority for reform to governance arrangements? The decision-making structures or the transparency of decisions? Should the decision makers under the EPBC Act be supported by different governance arrangements?

Not answered

4.F. Innovative approaches

The EPBC Act was created 20 years ago and takes a traditional regulatory approach – imposing rules on individuals and business through legislation to achieve environmental protection. The Act was not designed to consider or promote alternatives, such as ecosystem services markets, alternative financing arrangements, co- or self-regulation, environmental accounting and information and education-based approaches, noting there are likely limitations on the potential for these alternatives. The review provides an opportunity to consider increasing the role of such innovative approaches.

22. What innovative approaches could the review consider that could efficiently and effectively deliver the intended outcomes of the EPBC Act? What safeguards would be needed?

Not answered

23. Should the Commonwealth establish new environmental markets? Should the Commonwealth implement a trust fund for environmental outcomes?

Not answered

24. What do you see are the key opportunities to improve the current system of environmental offsetting under the EPBC Act?

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) acknowledges the necessity of having a system of environmental offsets under the EPBC Act to include measures to counterbalance the environmental impacts that remain after avoidance and mitigation measures (i.e. 'residual impacts'). The intention is that these offsets help to achieve long-term environmental outcomes for matters protected under the EPBC Act while providing flexibility for proponents seeking to undertake an action that will have residual impacts on those protected matters (Commonwealth of Australia 2012¹⁸, p. 9). The current policy makes useful recommendations about the importance of habitat quality, the necessity to effectively account for and manage the risks of the offset not succeeding, and that the size and scale of the offset should be proportionate to the likely residual impacts on the protected matter. There is the assumption that there will be sufficient and suitably robust data provided to allow these aspects to be fully considered.

*The current system of environmental offsetting under the EPBC Act has a strong focus on habitat protection, especially of terrestrial surface habitats. Less clear is how offsetting would be able to adequately protect ecological processes or flow-paths (e.g. groundwater flow-paths, stream or river segments) whose integrity relies heavily on being connected to recharge and discharge areas that might not fall within the area being set aside for offsetting. The IESC sees a key opportunity to **improve the current system of offsetting by providing clear guidance to proponents about how they might address the adequate offsetting of such highly connected systems**, if indeed it is possible.*

*A second key opportunity is to **clarify how best to deal with uncertainty when seeking to offset habitats whose dependence on groundwater is unclear yet may be a crucial determinant of the habitat's persistence**. For example, in the Sydney Basin, the validity of offsets to protect coastal upland swamps is challenged by uncertainty about the relative dependency of these ecosystems on surface versus groundwater water sources as well as whether the offset swamps are actually meeting the 'no worse' or 'better' criteria. Where habitats (such as swamps) are parts of landscape- or regional-scale mosaics, adequate information is needed on ecological connectivity and the importance of other processes that extend beyond the boundaries of the potential offset area and that may govern the long-term persistence of the proposed offset. These are especially pertinent when planning to use offsets to compensate for cumulative impacts that may arise because of significant loss of equivalent habitats, for example.*

The IESC commends the option of 'advanced environmental offsets' (Commonwealth of Australia 2017¹⁹) and agrees that these are generally likely to have greater conservation benefits than traditional offsets because they are established prior to any impact occurring and can be delivered

more strategically (e.g. placed close to wildlife corridors). However, the same concerns about adequately assessing connectivity (hydrological, biogeochemical and ecological links that sustain the habitat or ecological process to be protected) and dealing with uncertainty still remain, and should be addressed by the Act.

¹⁸Commonwealth of Australia (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

<http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy> [Accessed 12 March 2020].

¹⁹Commonwealth of Australia (2017). *Policy statement: Advanced environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999*. Australian Government, Department of the Environment and Energy, Canberra.

<https://www.environment.gov.au/epbc/publications/policy-statement-advanced-environmental-offsets-under-epbc-act> [Accessed 12 March 2020].

25. How could private sector and philanthropic investment in the environment be best supported by the EPBC Act?

Not answered

Could public sector financing be used to increase these investments?

Not answered

What are the benefits, costs or risks with the Commonwealth developing a public investment vehicle to coordinate EPBC Act offset funds?

Not answered

5. Principles to guide future reform

It is important that future reforms are guided by a set of principles. These principles should reflect what is important to Australians, and our goals for national environmental law.

26. Do you have suggested improvements to the above principles? How should they be applied during the review and in future reform?

Although the principles endorse the need for better access to information, they do not address the quality of this information, particularly its scientific rigour and credibility. If the information is poor or incomplete, the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining

*Development (IESC) is concerned that this may compromise the quality of environmental outcomes more severely than if the information were absent. Therefore, the IESC suggests that **the fourth principle needs to be improved to emphasise the scientific quality of the information.***

One way to enhance the scientific quality of the information provided by proponents of developments that may potentially impact on biodiversity and ecological processes is for the Act to recommend independent reviews of proponents' technical work during their studies (e.g. developing models that are fit for purpose). These independent reviewers should be technically competent and familiar with leading practices. For example in the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ('the JORC Code'), authors must sign in as recognised competent people who have chartered or registered status and at least five years of relevant experience in that particular commodity and/or style of mining. Their responsibility to all stakeholders is legally clear (not just a responsibility to the proponent who engages their services) and their work is far more likely to be of high scientific quality.

6. General questions

In addition to the specific questions asked earlier, the review is seeking to answer the following broad questions (located at the end of the discussion paper).

Not answered

27. Is the EPBC Act delivering what was intended in an efficient and effective manner?
28. How well is the EPBC Act being administered?
29. Is the EPBC Act sufficient to address future challenges? Why?
30. What are the priority areas for reform?
31. What changes are needed to the EPBC Act? Why?
32. Is there anything else of importance to you that you would like the review to consider?