The Reef 2050 Plan Independent Expert Panel

Submission to Queensland Parliamentary Innovation, Tourism, Development and Environment Committee

The Reef 2050 Plan Independent Expert Panel (IEP) advises Queensland and Commonwealth Governments. It was established under the Reef 2050 Plan to provide scientific advice related to the Great Barrier Reef, including to support implementation and review of the Reef 2050 Plan, Reef Water Quality Protection Plan, Reef Trust, and other matters, as requested.

In response to the Queensland Parliamentary Innovation, Tourism Development and Environment Committee's request for submissions on the *Environmental Protection (Great Barrier Reef Protection Measures) and Other Legislation Amendment Bill 2019,* the IEP provides the following key points.

The IEP:

1. recognises the important role of regulations as part of the mix needed to accelerate progress towards achievement of the Reef 2050 Water Quality Improvement Plan (Australian and Queensland governments 2018) targets and commends the Queensland Government for progressing this approach.
2. acknowledges that the content of the proposed regulations has been based on best available knowledge, including comprehensive consideration of the underpinning evidence, conclusions and recommendations included in the 2017 Scientific Consensus Statement (Waterhouse et al. 2017).
3. offers a number of observations related to effective delivery and implementation of the proposed Regulations, including the need for targeting and prioritisation, consideration of other options in addition to management practice change, integration of factors related to climate variability and the importance of effective and efficient data capture, management, evaluation and sharing.

This is further supported by the following commentary.

1. **Mitigation of poor water quality is a high priority for the Reef now.** The cumulative impacts of global warming, acute disturbances such as tropical cyclones, and regional pressures such as poor water quality, are reducing the resilience of Great Barrier Reef coastal and marine ecosystems. Poor water quality specifically reduces the recovery capacity of coral reefs (Ortiz et al. 2018; Wolff et al. 2018, MacNeil et al. 2019), which is particularly concerning in a context of more severe and/or more frequent disturbances. Recovery and complete coral community reassembly after major disturbance takes about a decade on offshore reefs, while inshore reefs require even longer timeframes (Johns et al., 2014). Current best understanding is that the recovery of seagrass meadows needs between two and eight years - without further disturbances (McKenzie et al., 2016). Improved water quality is expected to facilitate the recovery of the ecosystem, at least in some parts of the Reef, until greenhouse gas emissions are reduced (MacNeil et al. 2019). In effect this would 'buy' time to maintain the values of coastal and marine ecosystems and for the potential adaptation of key Reef organisms to future conditions.

2. **Water quality outcomes are not on target.** As noted in the *Strengthening Reef regulations* factsheet, at the present rate of practice change the Reef 2050 Water Quality Improvement Plan (Australian and Queensland governments 2018) targets for a healthy Reef will not be met. This slow uptake of practice change is also evident in the water quality outcomes (Figure 1), which shows the rate of progress to achieving the 2025 water quality targets. Progress to targets has not been sufficient to give confidence that the 2025 targets will be achieved. ***This highlights the***

importance of implementing a range of management, technical, policy and regulatory interventions to meet the targets i.e. no single approach will be successful. There is published evidence worldwide to suggest that voluntary approaches alone are not successful.

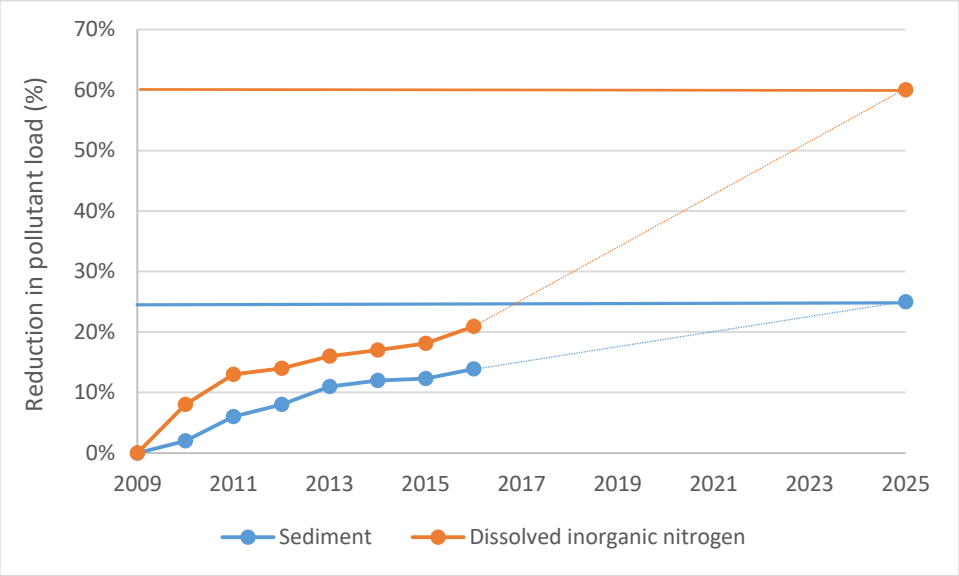

Figure 1. Reduction in sediment and nutrient loads since 2009 compared with the water quality targets for 2025. Data adapted from the Great Barrier Reef Report Card 2016 (Australian and Queensland governments 2017).

3. **Action needs to be targeted.** The proposed Reef regulations adopt a targeted approach, which is consistent with the science that shows sediment, nutrient, pesticide losses are spatially heterogeneous. For example, 12 of the 47 GBR catchments deliver 87% of the dissolved inorganic nitrogen entering the GBR lagoon whilst the Burdekin and Fitzroy regions account for ~60% of the total suspended sediments (Bartley et al. 2017). The sources of these land uses are also well documented with nutrients typically sourced from intensive cropping including sugarcane in coastal areas, and sediment sourced from rangeland grazing areas in the upper catchments (Bartley et al. 2017). Within sugarcane producing areas, there are areas where nitrogen use efficiency (the ratio of crop production to nitrogen fertiliser applications) is low and this contributes excess dissolved nitrogen. These areas need to be identified and factors leading to better management practice identified and adopted. Previous water quality targets were on a Reef wide basis but with the development of the Reef 2050 Water Quality Improvement Plan (Australian and Queensland governments 2018), end of catchment pollutant load reduction targets are now set on an individual catchment basis. This approach will support better targeting and prioritisation of on-ground management and investment, as will specific identification of hotspots for sediments and nutrients within catchments (Bartley et al. 2015).

   Prioritisation of practice change needs to be undertaken in the context of how the biophysical system responds, including system lags. For example, the proposed Reef regulations requires rapid implementation of minimum standards for grazing management by those producers with land in poor condition. Yet it can take more than a decade for land in poor condition to recover vegetative function sufficiently to reduce sediment and nutrient loss (Bartley et al. 2014) i.e. the system recovery may not occur until after the WQIP 2025 target. To ensure targets are met, there is a need to also target areas of land that are still in moderate condition and can recover relatively rapidly after improved grazing management is introduced (Ash et al. 2011).

Similarly, in intensive cropping systems such as sugarcane, the adoption of some improved practices may require implementation of a full crop cycle (typically 5 to 6 years), e.g. controlled traffic systems for minimising runoff) to be fully effective, but there are some practices where the water quality benefits may be evident in the shorter term (1-2 years, e.g. reduced fertiliser and pesticide inputs). Further, groundwater flow is a potentially important transport pathway for dissolved nitrogen (Bartley et al. 2017). Targeting action in areas where nitrogen is rapidly transported from fields to rivers through groundwater will provide benefits more quickly.

Social factors including economic and cultural influences, also have an important role in identifying priority actions and areas and need to be considered in future prioritisations. Delivery capacity varies between regions and catchments, and where possible, should also be taken into account.

These factors will be important in designing the enforcement and compliance programs for implementation of the Regulations and supporting investment programs to ensure maximum effectiveness and efficient use of the available resources.

4. **Water quality targets will not necessarily be met by management practice improvements alone; other actions such as largescale landscape remediation are also required.** The focus of efforts in water quality is, appropriately, through farmers and producers via capacity building, incentives, market instruments and regulation. For nutrients and pesticides, the outcomes for the GBR are almost entirely in response to inputs at the farmer/producer scale. Targets may not be met by improvements in management practices alone and other changes in land management may be required e.g. different cropping systems, targeted land retirements, incorporation of perennial pastures.

   Similarly, for sediments, it is unlikely that water quality targets can be met by management alone, with or without supporting regulation. Based on tracer studies, the contribution of sediments to the GBR are approximately 40% from gullies, 30% from streambanks, 20% from deep rill erosion from hillslopes and 10% from hillslope sheet wash erosion (Wilkinson et al. 2013). In individual catchments sub-surface erosion can contribute more than 80% of fine sediments (Olley et al. 2013). Improved grazing management will mostly reduce hillslope erosion losses and prevent new gullies from forming. Existing gullies and streambank erosion are less amenable to management actions and engineering solutions (e.g. gully remediation, check dams) are required to address these erosion sources. With 87,000 km of gullies in the GBR catchments (Wilkinson et al. 2015), this presents a significant challenge. The cost of fully repairing just 10% of gullies in the Burdekin catchment has been estimated to be $1.09 billion (cumulative present value) (Alluvium 2016). It is therefore important to recognise that the pathway to meeting targets needs a variety of approaches in addition to on-farm management e.g. appropriate policy instruments (Goulder and Parry 2008).

   The development of strategic water quality improvement implementation plans for the highest priority catchments would assist to design the best mix of actions that will deliver the greatest water quality benefits in a timely and cost-effective manner. These must build on the existing Regional Water Quality Improvement Plans.

5. **Management and policy responses need to better integrate climate variability and change.** The issue of climate variability and change is not mentioned in the regulations, nor does it feature strongly in best management practice frameworks. Recommended practice management

standards focus on the key inputs that affect water quality outcomes i.e. nutrient inputs, cultivation, machinery use, agronomic practices, pesticide use, grazing and herd management. One of the challenges for farmers and producers in managing nutrients and sediment loss is climate variability, and increasingly the emerging impacts of climate change. Management standards in some cases have adapting to climate variability implicitly built in to the recommended practices or there are recently developed techniques available (e.g. Everingham et al. 2018). Thus there is a strong case to explicitly include management practice standards that recognise both the existing challenges that climate variability imposes as well as the increasing risks posed by human-induced climate change.

As short-term (3-10 days) and seasonal forecasts improve in their accuracy there is an opportunity to more proactively incorporate them into management of fertiliser and pesticide application in cropping and horticulture systems, and in setting stocking rates in beef production systems. Increasing rainfall variability and intensity of extreme events associated with climate change (CSIRO and Bureau of Meteorology 2015) will make it more challenging to effectively and efficiently use fertilisers and pesticides and in beef enterprises, matching forage supply to animal numbers to maintain land in good condition. This is especially important in the GBR catchments because there is evidence that climate change will exacerbate natural climate variability, especially through changes to the frequency and intensity of El Nino Southern Oscillation (ENSO) (Cai et al. 2015). These risks need to be better incorporated into management practice standards.

6. **Systemic and transformative changes in land management and land use need consideration.** Whilst this issue is not within the remit of the proposed regulations, it is nevertheless an area that needs to be considered in the context of implementing a range of approaches alongside regulation to achieve the best outcomes possible. Current management standards and proposed regulations are largely predicated on existing land use and enterprises. There may be opportunities to reconfigure enterprises in a way that generate more significant water quality outcomes and provide co-benefits. For example, intensifying production on more productive and less vulnerable landscapes on beef enterprises and retiring more marginal and vulnerable land from grazing may maintain profitability, achieve better water quality outcomes, be better adapted to climate change, and provide co-benefits in biodiversity, methane reduction and other ecosystem services e.g. carbon. Evidence indicates that sediment reduction can be as high as 77% when gullied areas are retired from grazing (Wilkinson et al. 2018).

   Whole of supply chain impacts need to be considered when contemplating enterprise change e.g. retirement of land from production or shifting land from one crop to another may have negative impacts in a vertically integrated industry such as sugarcane where modest declines in sugarcane output in a district may make a sugar mill unviable (van Grieken et al. 2013). Avoiding perverse incentives within regulatory frameworks that prevent these types of adaptation responses is important to cost effectiveness.

7. **Better availability and use of data and information to support decision-making.** Management and policy decisions will be more rigorous if they are better informed by a strong evidence base. Making information on inputs (fertiliser use, pesticide use, stock numbers, agronomic and other management practices) and outputs (adoption rates of best management practice, crop yields, beef production, water quality, etc) more widely available is necessary to support a stronger evidence base for improving management and policy and reporting progress against targets. There are issues of privacy and trust which are constraining more effective use of data and

information. Establishment and maintenance of well-resourced data management systems that facilitate the capture, evaluation, application and sharing of information as part of the proposed Regulation is an essential component of implementation that warrants dedicated consideration and resource allocation as a matter of priority.

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15 March, 2019.