This submission is focussed on adequacy of management of the impacts of run-off, particularly from agricultural activities.

Management of water quality entering the Reef is currently largely driven by the *Reef Water Quality Protection Plan 2013* (the 'Plan'). Attention is drawn in this submission to deficiencies in both the content and structure, as well as implementation of the Plan.

Overall goal for the Plan

The overall goal for the Plan is:

> *to ensure that by 2020 the quality of water entering the reef from broadscale landuse has no detrimental impact on the health and resilience of the Great Barrier Reef.*

This goal is consistent with Australia's commitments under the International Convention on Biological Diversity, in particular Aichi Target 8, agreed under the Convention, viz.:

> *By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.*
>
> (http://www.cbd.int/sp/targets/)

Thus the overall goal is appropriate, and should be pursued with vigour.

Detail of the Plan

The Plan is primarily based around the 'Pressure – Stressor – Condition' model. For example:

Pressure	→	Stressor	→	Condition
E.g Grazing		increase in sediment load		loss of sea grass

Management actions are generally undertaken at the 'pressure' level, with consequent improvements in water quality.

This approach is commonly adopted, and could be regarded as 'best practice'. However, a critical feature of this approach is that there should be robust scientific logic linking the components. That is, there should be evidence provided that the target water quality loads would not be detrimental to the health and resilience of the Reef. Evidence should also be provided that **if** the adopted management activities are undertaken, **then** the water quality load targets are likely to be achieved.

The Plan falls short in these areas. Aspects of these deficiencies are expanded below.

Necessary reductions in load by 2020 are not explicitly identified

The key to judgement of success or otherwise of the Plan is knowledge of the levels of the quality of the water entering the Reef which would not have a detrimental impact. Although this is a matter of active research, inexplicably these have not yet been determined[1]. Without such targets it is impossible to establish if and when the overall goal for the Plan has been achieved.

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[1] A recent estimation was undertaken by WWF: '*Hitting the target: How much pollution can the Great Barrier Reef handle*?'. 2014 Prepared by Glen Holmes for WWF Australia.

Recommendation:

> *As a matter of priority, establish sustainable load targets to ensure no detrimental impact on the health and resilience of the Reef.*

Current water quality load targets will not protect the Reef

The estimated pre-European loads are the current best available estimate of the loads required to achieve the overall goal of 'no detrimental impact' on the Reef. Although these are likely to be conservative, they are appropriate to adopt for planning purposes. CSIRO has estimated both current and pre-European loads to the Reef from coastal catchments[2]. Using these figures, for suspended sediment, the required reduction is up to 82% to achieve the Reef Plan goal. Similarly, for dissolved inorganic nitrogen DIN the reduction required is up to 69%. (Note a slightly higher figure was estimated from the recent WWF study).

The Plan currently includes water quality load targets to only 2018, e.g., a 50% load reductions in nitrogen, 20% reduction in sediment and particulate nutrients in priority areas. On the evidence available, these targets are likely to be far less than would be required by 2020 to achieve the overall goal. Accordingly, even if the 2018 targets were achieved, there would be a massive task in reaching the overall sustainable load target in the period 2018 – 2020.

Recommendations:

> *To ensure achievement of the overall Plan goal, introduce explicit load reduction targets for 2020 reflecting the estimated sustainable loads.*
>
> *Strengthen the intermediate 2018 milestones to increase the likelihood of achieving the overall 2020 target water quality.*

Current management strategies in the Plan are not sufficient

The management strategies being adopted are insufficient to achieve even the current inadequate load reduction targets. For example, Roberts and Craig (2014) recently expressed the view that water quality targets were unlikely to be met **without significant land use changes**, and even then may take decades. [3]

A similar conclusion was reached by the Independent Expert Scientific Panel: "*While current management interventions are starting to address water quality in the Great Barrier Reef,* ***sustained and greater effort will be needed*** *to achieve the ultimate goal of no detrimental impact on the health and resilience of the reef. In addition to continuous improvement,* ***transformational changes in some farming technologies may be necessary*** *to reach some targets*".

This negative outlook is reflected in recent Plan report cards, where progress against targets could at best be described only as modest. Moreover, given that early gains are generally based on the 'low hanging fruit', the likelihood of achieving the required reductions in loads by 2020 given the current suite of management practices would appear to be unlikely. Drastically improved management

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[2] Kroon, FJ, Kuhnert, PM, Henderson, BL, Wilkinson, SN, Kinsey-Henderson, A, Abbott, B, Brodie, JE & Turner, RDR (2012). 'River loads of suspended solids, nitrogen, phosphorus and herbicides delivered to the Great Barrier Reef lagoon', *Marine Pollution Bulletin,* **65,** 167-181.

[3] Roberts, AM & Craig, RK (2014) 'Regulatory reform requirements to address diffuse source water quality problems in Australia: learning from US experiences'. *Australasian J Env. Mgm*., **21**, 102 - 115

practices are required. Modelling tools such as 'Source Catchments' seem adequate to estimate the impact of management actions on water quality loads.

Recommendation

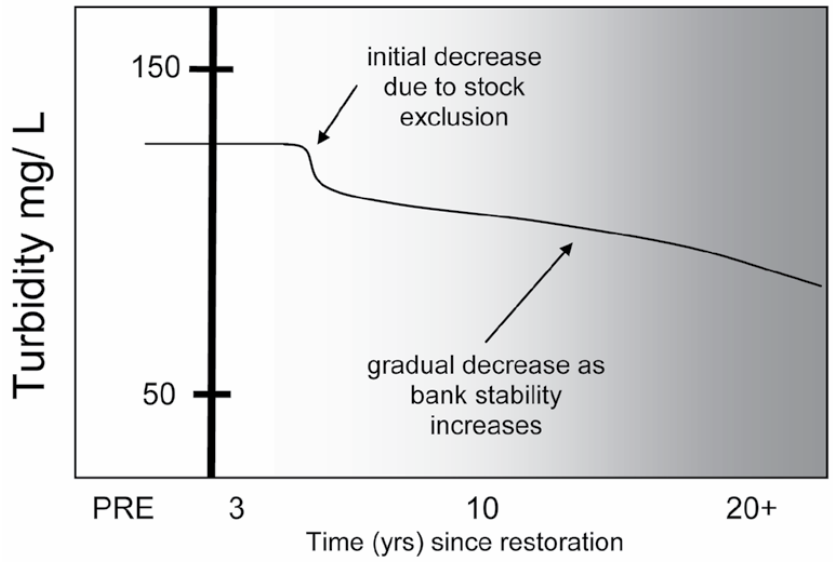
Identify and adopt management strategies which will demonstrably achieve the revised (sustainable) load targets.

This recommendation, in particular, may have significant resource implications. However, if the resources are not provided, the likelihood of protecting the Reef from water quality impacts would be negligible.

Current reporting of progress is misleading

Measures of performance are based on modelled performance of management strategies adopted. Although this is perfectly appropriate, and the models used are best available, they do not make it explicit that the actual improvement in water quality loads may take many years to eventuate.[4] A notional example is given below:

Time lag for improvements in water quality as a result of stock exclusion



From: Reich P., Lake P.S., Cavagnaro T.R., Ladson A.J., Johnson M., Daniel T.,Williams L., Borg D., Metzeling L. & McMaster D. 2009, 'A conceptual basis for ecological responses to livestock exclusion and replanting in riparian zones of lowland streams in the southern Murray–Darling Basin', A preliminary report to the Murray–Darling Basin Commission for project MD606 – *Evaluating the effectiveness of habitat reconstruction in the Murray–Darling Basin.*)

Thus the reported improvements in water quality may not actually eventuate for decades following the intervention. It therefore becomes important in the analysis and selection of possible management strategies to estimate the time lag before the improvement in water quality actually transpires.

Recommendation

[4] Meals, DW, Dressing, SA & Davenport, TE (2010) 'Lag time in water quality response to best-management practices: a review'. *J Env. Quality*, 39, 85-96.

Include in reporting best estimate of the timeframe for improvements in water quality to be achieved.

Impact of sludge disposal

Recent decisions to allow the dumping of sludge from port dredging raises questions about the commitment of the State and Australian Governments to protecting the Reef. Off-sets are included as part of the proposal. These will need to be carefully managed to prevent impact. To prevent damage to the Reef, it will be important that the off-set has achieved a real reduction in sediment load, prior to the dumping of dredge spoil. This is consistent with the Queensland Government's proposed use of off-sets to deal with point source discharges, viz.:

'*Nutrient reduction actions must be provided in advance or concurrently with impacts that are occurring so that* ***the nutrient reduction action provides the benefit at the time of additional nutrient release****'*. [5]

In accordance with the principle of 'additionality', the proposed off-set actions must be over and above those strategies as determined necessary under the Reef plan.

Recommendations:

The sediment reduction off-set action must provide the benefit at or ***before*** *the time of the spoil disposal*

[5] From: *Flexible options for managing point source water emissions: A voluntary market-based mechanism for nutrient management.* http://www.ehp.qld.gov.au/water/monitoring/documents/market-based-nutrient-managment-pilot.pdf