USING REGULATION TO TACKLE THE CHALLENGE OF DIFFUSE WATER POLLUTION AND ITS IMPACT ON THE GREAT BARRIER REEF

THE CHALLENGE OF MANAGING DIFFUSE SOURCE POLLUTION FROM AGRICULTURE: GBR CASE STUDY AND QUEENSLAND'S REEF PROTECTION LEGISLATION: AN ANALYSIS

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ABSTRACT: Diffuse water pollution poses a significant threat to water quality globally. Challenges associated with managing and regulating diffuse water pollution stem from difficulties in measurement and attribution of pollution 'emissions', as well as the cumulative nature of diffuse water pollution. The introduction of Queensland's *Great Barrier Reef Protection Amendment Act 2009* provides a timely opportunity to explore challenges associated with managing and regulating diffuse water pollution from agriculture, using the Great Barrier Reef as a case study. This article, which is presented in two parts (sections II and III), outlines the nature of diffuse water pollution; potential management and regulatory options; and existing policy, management and legislative frameworks that exist at Commonwealth and Queensland State government levels relevant to managing Great Barrier Reef water quality. In section III, the article undertakes a detailed analysis of Queensland's *Great Barrier Reef Protection Amendment Act 2009*, including an assessment of the likely effectiveness of this legislation; challenges associated with the implementation, monitoring and evaluation of measures taken under this new legislation; and its significance and role in the context of other relevant Commonwealth and Queensland government responsibilities, legislation and policies.

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I INTRODUCTION

On 1 January 2010, the *Great Barrier Reef Protection Amendment Act 2009* (Qld) came into effect in Queensland.[1] That Act inserted a new ch 4A into the

[1] This article is written based on the laws in force as at March 2012. Since that time, there has been a change of government in Queensland, and the new State Government is reviewing

Environmental Protection Act 1994 (Qld) ('*EP Act*') to provide the Queensland Government with greater statutory power to control actions that pose key threats to the health of the Great Barrier Reef (GBR) ecosystem, including power to 'reduce the impact of agricultural activities on the quality of water entering the reef'.[2] The introduction of this legislation is significant not only because it seeks to increase protection of the world's best known, and most extensive coral reef system,[3] it is also the first time in Queensland that legislation has been enacted that specifically seeks to regulate the impact of diffuse water pollution from agriculture.[4]

Diffuse pollution, or non-point source pollution, is defined as 'pollution that comes from a wide range of different sources and cannot be attributed to one point of dispersal, such as a pipe or waste outlet'.[5] In GBR catchments, diffuse pollution from agriculture, and in particular cattle grazing and crop production, 'are the most significant contributors to pollutant discharges into the GBR lagoon'.[6] There is increasing evidence that water quality in the GBR lagoon has, due to these increased pollutant loads, declined to levels likely to cause environmental harm.[7] This issue has prompted a number of policy and management responses by the Queensland and Australian governments, including the development of Reef Water Quality Protection Plans (2003 and 2009). The introduction of Queensland's *Great Barrier Reef Protection*

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many environmental policies. It was uncertain at the time of writing what changes, if any, would occur to the laws and policies discussed in this article.

2 *Great Barrier Reef Protection Amendment Act 2009* (Qld) s 6, which inserted a new s 74(a) into the *EP Act*. There were associated amendments to other Acts; in particular, pt 1A inserted related provisions into the *Chemical Usage (Agricultural and Veterinary) Control Act 1988* (Qld).

3 Department of Sustainability, Environment, Water, Population and Communities, *The Great Barrier Reef, Queensland* (3 October 2012) World Heritage Places <www.environment.gov.au/heritage/places/world/great-barrier-reef/index.html>.

4 Chris McGrath, *Does Environmental Law Work? How to Evaluate the Effectiveness of an Environmental Legal System* (Lambert Academic Publishing, 2010) 216.

5 State of Queensland (Department of Premier and Cabinet), *Reef Water Quality Protection Plan 2009 for the Great Barrier Reef World Heritage Area and Adjacent Catchments* (Reef Water Quality Protection Plan Secretariat, 2009) 8. (*2009 RWQPP*)

6 Productivity Commission, *Industries, Land Use and Water Quality in the Great Barrier Reef Catchment* (Research Report, Productivity Commission, 2003) xxix. Note: the GBR 'lagoon' is a commonly used (non-legal) term to describe the body of water seaward from the mainland coastal zone, which is largely devoid of reefs, for example as referred to in: Great Barrier Reef Marine Park Authority, *Great Barrier Reef Outlook Report 2009: In Brief* (Great Barrier Reef Marine Park Authority, 2009) 17. The GBR lagoon makes up approximately 33% of the continental shelf area of the GBR Marine Park. See David Wachenfeld et al, 'Chapter 1 – Introduction to the Great Barrier Reef and Climate Change' in Johanna E Johnson and Paul A Marshall (eds), *Climate Change and the Great Barrier Reef* (Great Barrier Reef Marine Park Authority and Australian Greenhouse Office, 2007) 3.

7 Joe Baker et al, *Scientific Consensus Statement on Water Quality in the Great Barrier Reef* (State of Queensland Reef Water Quality Protection Plan Secretariat, 2008).

Amendment Act 2009 and its insertion of the new ch 4A of the *EP Act* is, however, the most significant response because it acknowledges the need for regulatory measures to manage these impacts of diffuse source pollution.

Diffuse pollution is not just a problem for the GBR; in fact, the impact of diffuse pollution is considered to be 'today's leading water quality problem,'[8] and it has also been referred to as the 'unfinished business of water quality regulation in Australia'.[9] The regulation of water pollution in Australia has largely dealt with point source pollution, which has been described as the 'low hanging fruit',[10] or 'first generation'[11] of water pollution regulation in Australia due to the relative ease of managing and regulating point source pollution compared to diffuse source pollution. The 'complexity, heterogeneity and dispersion of the diffuse sources, and the inability to monitor them', together with the cumulative nature of diffuse pollution, present challenges for governments seeking to address this issue in a viable and cost effective manner.[12] In the case of the GBR, these challenges are further exacerbated by the scale, complexity and diversity of the GBR ecosystem and its adjacent catchments. The introduction of reef protection legislation in Queensland therefore provides a useful case study to examine the use of regulatory measures to address the impacts of diffuse pollution on water quality.

This article has two major parts (Sections II and III). The article will first examine the nature of diffuse water pollution and challenges associated with its management and regulation, using diffuse water pollution from agriculture and its impact on the GBR as a case study. This part will also review pre-existing Commonwealth and Queensland legislation, policies and strategies relevant to diffuse water pollution and the GBR. In the second major part, an analysis of Queensland's *Great Barrier Reef Protection Amendment Act 2009* will be undertaken, focussing primarily on the new ch 4A of the *EP Act.* This analysis will include an assessment of the likely effectiveness of this legislation; challenges associated with the implementation, monitoring and evaluation of measures taken under this new legislation; and its significance and role in the context of other relevant Commonwealth and Queensland government responsibilities, legislation and policies.

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8 Neil Gunningham and Darren Sinclair, 'Policy Instrument Choice and Diffuse Source Pollution' (2007) 17(1) *Journal of Environmental Law* 51, 51. ('Policy Instrument Choice')

9 Rebecca Nelson 'Regulating Nonpoint Source Pollution in the US: A Regulatory Theory Approach to Lessons and Research Paths for Australia' (2011) 35(2) *University of Western Australia Law Review* 340.

10 Ibid 341.

11 Gunningham and Sinclair, 'Policy Instrument Choice', above n 8, 51.

12 Productivity Commission, above n 6, xxii.

II THE CHALLENGE OF MANAGING DIFFUSE SOURCE WATER POLLUTION: GBR CASE STUDY

A *General Overview of Diffuse Water Pollution, its Management and Regulatory Options*

The term 'diffuse water pollution' is used to define 'all sources of pollution that enter waters other than from identifiable entry points ... [including] contaminants that enter waters through surface water runoff or by percolation through soil, or wherever the point of entry cannot be precisely located'.[13] The release or 'emission' of pollution from diffuse sources into groundwater, lakes, waterways and coastal waters is therefore influenced by geographic, geological and climatic factors.[14] This poses a number of key challenges in terms of management and regulation. Firstly, the 'emissions' of diffuse water pollution are difficult to measure and to attribute to a particular activity or property.[15] Secondly, given that there may be many sources involved, the cumulative nature of diffuse water pollution also creates management and regulatory challenges, which are linked to those of measurement and attribution.

Protecting water quality from pollution, for the sake of downstream water users,[16] has always been a matter of interest in common law.[17] For example, for water flowing in a defined river or watercourse, common law protects the quality of water flowing to downstream users with water used upstream required to be returned to the watercourse 'substantially undiminished in quantity and quality'.[18] The protection of water quality from pollution is now reflected in Australian statutory law, with legislation in each State, dealing with the control of water pollution.[19] Over time, the focus of legislation that has the power to regulate water quality has broadened from the protection of individual property rights (such as under common law) and public health, to the protection of environmental values and minimising environmental harm.

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13 William Howarth, 'Diffuse Water Pollution and Diffuse Environmental Laws: *Tackling Diffuse Water Pollution in England*, Report by the Comptroller and Auditor General, HC 186, Session 2010–2011, 6 July 2010' (2011) 23(1) *Journal of Environmental Law* 129, 130.

14 Neil Campbell et al, *Diffuse Pollution: An Introduction to the Problems and Solutions* (IWA Publishing, 2004) 8–9.

15 Ibid 6.

16 Noting, as observed by Bates that the common law seeks to protect landowners property rights (including the right to water) rather than the environment per se. Gerry Bates, *Environmental Law in Australia* (LexisNexis Butterworths, 7th ed, 2010) 25 [3.2].

17 D E Fisher, *Water Law* (LBC Information Services, 2000) 284.

18 Poh-Ling Tan, *Agriculture and Natural Resource Management in the Murray-Darling Basin: A Policy History & Analysis* (Institute for Rural Futures, 2002) 3.

19 Fisher, above n 17, 285.

Literature on diffuse water pollution management points to the difficulties of emissions detection measurement (including at the property level) as a key challenge, influencing approaches to the management and regulation of diffuse pollution.[20] It has been argued that the regulation of non-point source emissions themselves is impractical, with the regulation of *activities* contributing to emissions presenting a more feasible approach.[21] Analyses of policy options for the management of diffuse pollution have found that responses need to be considered in context,[22] including consideration of policy instruments that seek to influence land use patterns, farm management practices and landscape changes.[23] These policy options could include education and information initiatives, voluntary instruments (including industry codes of practice), economic instruments (including taxing fertilisers), regulatory instruments and planning instruments.[24]

In their review of policy instrument choices for the management of diffuse source pollution, Gunningham and Sinclair (2005) explore various policy options, standards and compliance mechanisms, and they make a number of observations of relevance to the management of diffuse water pollution, including that:

- the management of diffuse water pollution is complex and politically sensitive; difficulties in measuring diffuse pollution emissions, and quantifying reductions required at a property level, limit or negate the practicality of some policy options;
- internationally, 'process standards', such as farm management plans, nutrient management plans, or codes of practice have been the 'preferred choice for agricultural environmental improvement', and the success of these approaches is dependent on their scope, implementation and compliance;
- regulating agricultural inputs through quotas and bans has proven to be successful and has the potential to be very effective; however, this approach can potentially create a large administrative burden in terms of implementation and compliance; and
- policy makers have largely sought to address diffuse pollution through voluntary mechanisms; however, this approach has been 'manifestly unsuccessful'.[25]

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20 Commonly identified as the key issue, for example by Gunningham and Sinclair , 'Policy Instrument Choice', above n 8; Campbell et al, above n 14; Howarth, above n 13.

21 Campbell et al, above n 14, 6.

22 For example, by Gunningham and Sinclair, 'Policy Instrument Choice', above n 8.

23 J Brodie and K Fabricius, 'Terrestrial Runoff to the Great Barrier Reef and the Implications for its Long Term Ecological Status' in Pat Hutchings, Mike Kingsford, and Ove Hoegh-Guldberg *The Great Barrier Reef: Biology, Environment and Management* (CSIRO Publishing, 2008) 109.

24 Gunningham and Sinclair, 'Policy Instrument Choice', above n 8, 53.

25 Ibid.

It is worth emphasising this final point: voluntary measures alone are unlikely to be effective in controlling diffuse pollution. In an earlier work in 2004, Gunningham and Sinclair concluded from an analysis of non-point source pollution in the Swan-Canning river catchment in Western Australia that:

> There is little evidence to suggest that various forms of exhortation, *when used in isolation*, have the capacity to deliver tangible environmental improvements when applied to matters of non-point source pollution. Indeed, there is a substantial body of evidence ... which suggests quite the contrary. Unless landholders have a self-interest in engaging in the desired environmental improvements, then information, education and voluntarism alone will usually be unable to overcome the cost barriers (and sometime conservatism) that often inhibit change. For these reasons such measures should *not* be used as "stand alone" approaches to reducing non-point source agricultural pollution in the Swan-Canning river catchment. This is an important conclusion, yet one which policymakers have been most reluctant to hear notwithstanding a growing, and now almost overwhelming, body of evidence to support it.[26]

Reviews of diffuse water pollution management programs in the United States by Nelson[27] and Brull[28] come to similar conclusions. For example, in the Chesapeake Bay Program, ambitious goals and cooperative cross-jurisdictional management frameworks were established, but these have not led to significant reductions of diffuse pollution, due to a reliance on voluntary actions at the state and property level without adequate incentives, and inadequate resources for implementation and compliance.[29] The US *Clean Water Act* and California's *Water Quality Control Act* include enforceable regulatory instruments for diffuse pollution, which Nelson argues has 'produced notable success stories, if not uniformly effective outcomes'.[30] In these cases, the following factors were identified as being key to success: 'goal setting which includes nonpoint sources [and loads], broad stakeholder participation, good information, and ecological focus, and requiring "proof of concept" for management plans to be approved'.[31]

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26 Neil Gunningham, and Darren Sinclair, 'Non-point Pollution, Voluntarism and Policy Failure: Lessons from the Swan-Canning' (2004) 21 *Environmental and Planning Law Journal* 93, 103 ('Non-point Pollution, Voluntarism and Policy Failure').

27 Nelson, above n 9.

28 Sarah Brull 'An Evaluation of Non-Point Source Pollution Regulation in the Chesapeake Bay' (2006) 13 *University of Baltimore Journal of Environmental Law* 221.

29 Ibid 221–49.

30 Nelson, above n 9, 380–1.

31 Ibid.

In a review (in the 1990s) of then best management practices in agriculture and their effectiveness in reducing diffuse water pollution, Novotny and Olem found that: improved management of nutrient application (including consideration of timing, rates and location of application) could lead to significant reductions in nitrogen and phosphorus losses from the land; and excluding livestock from waterways and establishing riparian buffer zones could lead to reductions in loss of sediment, total phosphorus and total nitrogen. This review found that the barriers to uptake of best management practices, and the control of diffuse pollution included: lack of awareness, lack of understanding, lack of incentives, and lack of consistent regulatory support at a state or federal level for local control efforts.[32] Incentives for uptake of best management practices could include education and awareness raising, technical assistance, rebates or subsidies, cross compliance legislation built into existing programs, peer pressure and the direct regulation of land-use and production activities.[33] Some argue that focusing policy instruments on addressing barriers and providing incentives to adopt best management practices such as these will most effectively control agricultural diffuse water pollution.[34]

B *Diffuse Water Pollution from Agriculture and its Impacts on the Great Barrier Reef Region*

One of the world's largest World Heritage Areas,[35] the iconic Great Barrier Reef stretches for 2300km along the Queensland coast, and as far as 400km from the coast to the outer reefs, covering an area of over 360 000km^2 in total.[36] The GBR Region[37] is a large, complex ecosystem that supports thousands of different species of marine plants and animals.[38] In addition to its outstanding global ecological importance, the GBR also has significant economic, cultural and social values. In 2009, it was estimated that the GBR contributed $5.46 billion to the Australian economy, and it supports regional business and employment

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32 Vladimir Novotny and Harvey Olem, *Water Quality: Prevention, Identification, and Management of Diffuse Pollution* (Van Nostrand Reinhold, 1994) 723.

33 Ibid 728–9.

34 Brett A Bryan and John M Kandulu, 'Designing a Policy Mix and Sequence for Mitigating Agricultural Non-Point Source Pollution in a Water Supply Catchment' (2011) 25 *Water Resources Management* 875.

35 Department of Sustainability, Environment, Water, Population and Communities, *The Great Barrier Reef, Queensland* (3 October 2012) World Heritage Sites <http://www.environment.gov.au/heritage/places/world/great-barrier-reef/index.html>.

36 Pat Hutchings, Mike Kingsford, and Ove Hoegh-Guldberg, *The Great Barrier Reef: Biology, Environment and Management* (CSIRO Publishing, 2008) 1.

37 The GBR Region is defined in sch 1 of the *Great Barrier Reef Marine Park Act 1975* (Cth).

38 Wachenfeld et al, above n 6, 3.

through tourism, fishing and other industries.[39] Complex interdependencies and links between species and environments (including marine and terrestrial environments) characterise the unique GBR ecosystem,[40] highlighting the need for an ecosystem-based approach to management of the GBR and its catchments. The GBR is linked to, and receives runoff from, 38 major catchment areas that cover an area of approximately 424 000km^2 in total,[41] or around 25 per cent of Queensland.[42] These GBR catchments are shown in Figure 1.

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39 State of Queensland (Department of Premier and Cabinet), *2009 RWQPP*, above n 5, 7.

40 Paul A Marshall and Johanna E Johnson, 'Chapter 24 – The Great Barrier Reef and Climate Change: Vulnerability and Management Implications' in Johanna E Johnson and Paul A Marshall (eds) *Climate Change and the Great Barrier Reef: A Vulnerability Assessment* (Great Barrier Reef Marine Park Authority and Australian Greenhouse Office, 2007) 781.

41 Great Barrier Reef Marine Park Authority, *Great Barrier Reef Outlook Report 2009*, above n 6, 11.

42 Miles Furnas, *Catchments and Corals: Terrestrial Runoff to the Great Barrier Reef* (Australian Institute of Marine Science and CRC Reef Research Centre, 2003) 41.

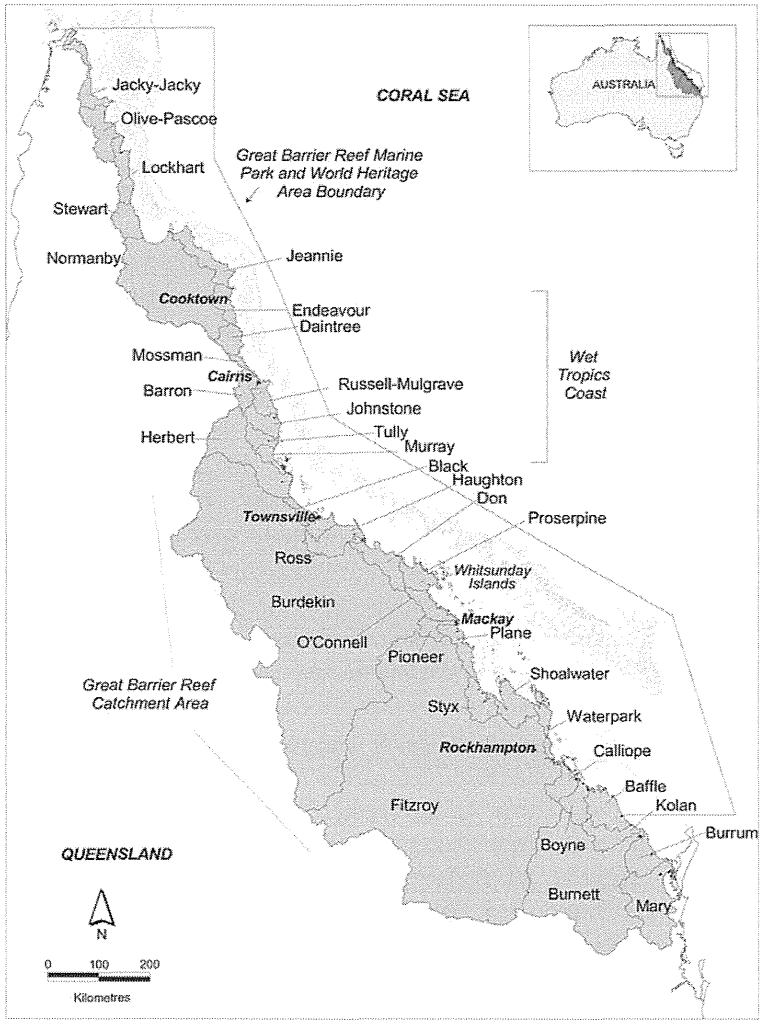

FIGURE 1: MAP OF GREAT BARRIER REEF CATCHMENTS (SOURCE: QUEENSLAND GOVERNMENT)[43]

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43 From 'Figure 1: Map of the Great Barrier Reef World Heritage Area and Catchments': State of Queensland and Commonwealth of Australia, *Reef Water Quality Protection Plan: For Catchments adjacent to the Great Barrier Reef World Heritage Area* (Queensland Department of Premier and Cabinet, 2003).
The document and the map within it are accessible at Queensland Government, *Reef Water Quality Protection Plan* (20 April 2012) Queensland Government <www.reefplan.qld.gov.au/resources/assets/reefplan-2003.pdf>. This map is reproduced here with the permission of the Queensland Government.

Ecosystems of the GBR receive the nutrients required to sustain them from a variety of sources, including terrestrial runoff. Under natural conditions, the runoff of freshwater and sediments from adjacent catchments supports the productivity, growth and evolution of coral reefs.[44] Over the last 150 years, however, GBR catchments have been significantly modified, and the level of nutrients and sediment deposited onto the Great Barrier Reef from these catchments has increased significantly. The *2007 Water Quality Report: Great Barrier Reef Catchments and Inshore Ecosystems* reported end of river monitoring in a number of priority catchments that showed that the combined levels of sediment being discharged into the GBR lagoon from these catchments was approximately four times greater than estimated pre-European levels; and, levels of nitrogen and phosphorus were five and four times estimated pre-European levels, respectively.[45] A number of pesticides used on agricultural lands across the GBR catchments are also being detected in fresh and marine environments in the region.[46]

The most significant sources of diffuse pollution impacting on GBR water quality are 'soil erosion and the overuse/misuse of fertilisers and chemicals by cropping industries'.[47] Overall, it is estimated that the delivery of sediments, nutrients and pesticides from catchments into the GBR lagoon has increased six-fold since European settlement.[48] This decline in water quality due to increased levels of sediments, nutrients and pesticides has already impacted on GBR ecosystems, particularly inshore reefs and associated ecosystems,[49] with impacts including die-back of mangroves, increased algae on coral reefs, accumulation of pollutants in sediments and marine species, reduction in light and the smothering of corals.[50] Furnas and Mitchell (2001) argue that, in the longer term, 'extensive coral reefs do not typically develop or persist where nutrient and suspended sediment concentrations are acutely or chronically high'.[51] Management of diffuse water pollution from agriculture and the significant threat that it poses to the GBR has, therefore, become a priority for the Australian and Queensland governments.

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44 Furnas, above n 42, 3.

45 State of Queensland (Environmental Protection Agency), *2007 Water Quality Report: Great Barrier Reef Catchments and Inshore Ecosystems* (Environmental Protection Agency, 2008) 6–7.

46 Great Barrier Reef Marine Park Authority, *Water Quality Guidelines for the Great Barrier Reef Marine Park: Revised Edition 2010* (Great Barrier Reef Marine Park Authority, 2010) 29.

47 Productivity Commission, above n 6, xxxix.

48 State of Queensland (Environmental Protection Agency), above n 45, 21.

49 Productivity Commission, above n 6, xxii.

50 Great Barrier Reef Marine Park Authority, *Great Barrier Reef Outlook Report* 2009, above n 6, i, 5.

51 Miles Furnas and Alan Mitchell, 'Runoff of Terrestrial Sediment and Nutrients into the Great Barrier Reef World Heritage Area' in Eric Wolanski (ed), *Oceanographic Processes of Coral Reefs: Physical and Biological Links in the Great Barrier Reef* (CRC Press, 2001) 37.

As shown in Figure 1, the GBR catchments stretch almost the entire length of the Queensland east coast, from Cape York in the north to the Mary River catchment in South-East Queensland. These catchments vary in size from 533km^2 (Mossman) to 142 460km^2 (Fitzroy), and across this large geographical range, there is huge variation between (and within) catchments, with diverse topography supporting diverse vegetation types. Catchments also vary in terms of human impact and degree of land use change and land uses.[52] Agriculture is a dominant land use across all modified catchments, with industries including sugar cane farming and cattle grazing (both dominant industries), dairying, as well as banana, cotton and grain growing. There is considerable climatic variation, ranging from wet tropics in the north, the central dry tropics, to the sub-tropical climates in the south, with highly variable rainfall distribution across the region.[53] There can be significant annual variation in rainfall and runoff, with large rainfall or flood events resulting in 'flood plumes' entering the GBR lagoon. The development and size of these flood plumes is 'related to catchment characteristics (size, vegetation cover and gradient), rainfall intensity, duration and distribution and flow volume and duration'.[54] Some reefs will encounter freshwater runoff (and associated diffuse pollution) on an annual basis, some episodically, and some rarely, if ever.[55] There is, therefore, considerable variation along the length of the GBR in terms of levels and quality of runoff into the Reef lagoon, frequency of flooding or runoff events, variation in levels of sediments and nutrients reaching inshore and mid shelf reefs, and the impact of these events. As well as these larger scale factors that will influence the magnitude and nature of diffuse water pollution in a particular GBR region, there are also more localised factors that influence how, and at what levels, diffuse pollution enters waterways from a particular property. These include on-farm management practices, such as the type, timing, amount and method of fertiliser and pesticide application, soil erosion mitigation measures, level of groundcover, distance from a waterway, soil properties and local hydrology.[56] All of these factors influence the nature and relative contribution of diffuse pollution from these catchments impacting on GBR water quality.

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52 Ibid 48.

53 Great Barrier Reef Marine Park Authority, *Population and Major Land Use in the Great Barrier Reef Catchment Area: Spatial and Temporal Trends* (Great Barrier Reef Marine Park Authority, 2001) i, 4.

54 Michelle Devlin et al, *Flood Plumes in the Great Barrier Reef: Spatial and Temporal Patterns in Composition and Distribution*, Research Publication No 68 (Great Barrier Reef Marine Park Authority, 2001) 3.

55 Ibid 2.

56 Gunningham and Sinclair, 'Policy Instrument Choice', above n 9, 51–81; W B Clapham et al, 'Human Activities in the Drainage Basin as Sources of Nonpoint Pollutants' in Jeffrey A Thornton et al (eds), *Assessment and Control of Nonpoint Source Pollution of Aquatic Ecosystems: A Practical Approach*, Man and the Biosphere Series vol 23 (UNESCO & Parthenon Publishing, 1999).

It is also important to consider the additional and associated threat of climate change to the GBR ecosystems, and the negative interaction between climate change and diffuse water pollution. Climate change impacts such as increased sea temperatures and coral bleaching, sea level rise and increased intensity of tropical cyclones, as well as the impacts of ocean acidification, all pose significant threats to the GBR.[57] In addition to these direct climate change impacts, the *Climate Change and the Great Barrier Reef: A Vulnerability Assessment* report found that changed rainfall regimes and the increased intensity of extreme events (such as cyclones) that are projected to occur with climate change will exacerbate diffuse water pollution and further impact on water quality in the GBR lagoon.[58] Under projected climate change scenarios, it is predicted that rainfall and river flow is expected to be more variable, with more intense droughts and rainfall events. This is significant as droughts can reduce soil cover and expose soils to loss,[59] and 'floods that break a long drought can lead to sediment loads several times those of other floods of similar size'.[60] Increased soil erosion and loss will increase levels of sediments, nutrients and pesticides discharging onto the Reef. There is another synergistic link between climate change and diffuse pollution impacting on the GBR: poor water quality reduces the resilience of GBR ecosystems and their ability to recover from climate change related impacts such as coral bleaching. In fact, in 2007 the *Climate Change and the Great Barrier Reef: a Vulnerability Assessment* found that 'the negative interaction between climate stressors and poor water quality ... has the potential to seriously undermine the resilience of nearly every component of the GBR ecosystem'.[61] There is, therefore, an additional imperative to effectively manage and reduce the impacts of diffuse water pollution in order to protect and improve the resilience of the GBR to the impacts of climate change.

C *Managing Water Quality for the Great Barrier Reef and Adjacent Catchments*

The Commonwealth and Queensland governments have worked in partnership for decades to protect and manage the GBR. This arrangement reflects historical responsibilities for the management of Australia's territorial sea, the coastal zone, and land and fresh water resource management. The arrangements are complex and often confusing in many regards. Following the enactment of the *Seas and*

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57 Great Barrier Reef Marine Park Authority, *Great Barrier Reef Outlook Report 2009* above n 6, 9.

58 Marshall and Johnson, above n 40, 774.

59 State of Queensland (Department of Premier and Cabinet), *2009 RWQPP*, above n 5, 10.

60 Productivity Commission, above n 6, xxxix.

61 Marshall and Johnson, above n 40, 790.

Submerged Lands Act 1973 (Cth) and the 1975 High Court decision[62] that 'found in favour of the constitutional validity of that legislation'[63] and Commonwealth sovereignty over Australia's territorial sea, the Commonwealth and State governments negotiated the *Offshore Constitutional Settlement.*[64] This settlement clarified jurisdictional responsibilities and arrangements for managing activities in the territorial sea, such as mining, shipping and fishing. It generally provided States with responsibility for managing coastal waters,[65] and outlined an agreement by the Commonwealth and Queensland governments to 'establish joint consultative arrangements for the management and preservation' of the GBR region.[66] While the Commonwealth's management powers over the GBR region have been greatly enhanced by the enactment of the *Great Barrier Reef Marine Park Act 1975* (Cth) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth), discussed below, the Queensland Government retains primary responsibility for the management of GBR catchments, including the regulation of water resources,[67] and 'most of the operational day-to-day management of the Marine Park is delivered by Queensland agencies'.[68]

1 *Overview of Australian Water Quality Frameworks, Policies and Programs Relevant to the GBR*

There are two national frameworks for water quality in Australia: the *National Water Quality Management Strategy* (NWQMS), and the *National Action Plan for Salinity and Water Quality* (NAPSWQ). The latter ran from 2000–2008 before becoming the *Caring for our Country* initiative.[69] The NWQMS has been

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62 *New South Wales v Commonwealth* (1975) 135 CLR 337 ('*Sea and Submerged Lands Act Case*').

63 Donald R Rothwell and Rachel Baird 'Australia's Coastal and Marine Environment' in Rachel Baird and Donald R Rothwell (eds), *Australian Coastal and Marine Law*, (Federation Press, 2011) 1, 3.

64 Attorney-General's Department, *Offshore Constitutional Settlement: A Milestone in Cooperative Federalism* (Australian Government,1980). See also Rachel Baird, 'The National Legal Framework' in Rachel Baird and Donald R Rothwell (eds), *Australian Coastal and Marine Law* (Federation Press, 2011) 45–66.

65 Coastal waters of the State was then defined in *Coastal Waters (State Powers) Act 1980* (Cth) s 3(1).

66 Attorney-General's Department, above n 64, 11.

67 In Australia, this is a responsibility that under the Australian Constitution generally lies with States: Alex Gardner, Richard Bartlett and Janice Gray, *Water Resources Law* (LexisNexis Butterworths, 2009) ch 5. (Note: This chapter is co-authored by Gerard Carney.)

68 Matthew Osborne 'Commonwealth and State Marine Environmental Management' in Rachel Baird and Donald R Rothwell (eds), *Australian Coastal and Marine Law* (Federation Press, 2011) 67, 78–9.

69 Currently under review in the approach to Phase II of the Caring for Country Initiative. See, eg, *Let's Continue the Conversation*, Caring for our Country (4 October 2012) [*Caring*

in place since 1992 and includes a suite of policies, processes and guidelines to improve water quality in Australia. Among them are the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC Guidelines), which are intended to be used as a guide by state, territory, regional and local bodies in the development of their own guidelines and water quality objectives.[70]

In 2000, the Commonwealth and state and territory governments agreed on the *National Action Plan for Salinity and Water Quality* to support action by the community and land managers in priority regions to manage water quality.[71] Key elements of this program included setting regional water quality targets, and also establishing and supporting regional natural resource management bodies responsible for developing integrated regional/catchment natural resource management plans. This program was replaced by the *Caring for our Country* initiative in 2008. *Caring for our Country* focuses on a number of areas of strategic priority, including 'coastal environments and critical aquatic habitats', which encompasses water quality goals specific to the GBR.[72] Funding of $200 million over five years for the Commonwealth Government's *Caring for our Country – Reef Rescue Package* is committed towards achieving these goals. Most of this funding is to provide water quality grants for farmers in GBR catchments to resource improved farm management practices that aim to reduce diffuse water pollution. This funding, together with education and information services and capacity building support for landholders, is provided via the natural resource management regional bodies established under NAPSWQ. The *Caring for our Country – Reef Rescue Package* also funds water quality monitoring and reporting by the GBR Marine Park Authority. Although the water quality grants provide farmers with a significant incentive to adopt best management practices and to act to reduce diffuse water pollution, this program is entirely voluntary, and has no compliance or enforcement component.

The *Reef Water Quality Protection Plan: For Catchments Adjacent to the Great Barrier Reef World Heritage Area* (RWQPP) was first jointly released by the Commonwealth and Queensland governments in 2003, and a revised version was released in 2009. These Plans set the overarching goal of 'halting and

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for our Country Consultation Summary document] accessible <http://caringforourcountry review.com.au/document/index/1>.

70 Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, *National Water Quality Management Strategy: An Introduction to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (October 2000) <http://www.environment.gov.au/water/publications/quality/nwqms-introduction-4a.html>. The ANZECC Guidelines are also under review.

71 Australian Government, *National Action Plan for Salinity and Water Quality*, National Action Plan for Salinity and Water Quality Archive (30 June 2008) <www.napswq.gov.au>.

72 Australian Government Caring for our Country, *Our Priorities: Coastal Environments and Critical Aquatic Habitats* (29 November 2012) <http://www.nrm.gov.au/about/caring/priorities/coastal.html>.

reversing the decline of water quality entering the Reef'[73] by reducing diffuse water pollution and rehabilitating and conserving areas of the GBR catchment that play a role in reducing or removing water pollutants.[74] The 2003 RWQPP included strategies for achieving this goal including 'self-management' approaches; education and extension; economic incentives; planning for natural resource management and land use; regulatory frameworks; research and information sharing; partnerships and targets; monitoring and evaluation.[75] A central element of the 2003 RWQPP was the use of a risk based management approach to identify and target high priority Reef catchments for the purpose of reducing diffuse water pollution.[76] As a result, ten 'nutrient management zones' were identified as priority areas of focus, with the Wet Tropics, Mackay/Whitsunday and Burdekin catchments identified as the three Nutrient Management Zones of the highest priority.[77]

The revised 2009 RWQPP responded to assessments that action taken under the 2003 RWQPP had been ineffective in 'solving the issue of declining water quality in the Reef'.[78] The 2009 Plan builds on its predecessor, but it includes and is *underpinned by* 'clear and measurable targets, improved accountability and more comprehensive and coordinated monitoring and evaluation'.[79] The 2009 RWQPP moved away from the detailed strategy/action based approach of the 2003 Plan and is intended to provide a framework for the Commonwealth and Queensland governments, regional Natural Resource Management (NRM) bodies and industries, to work in cooperation towards reducing diffuse water pollution from agriculture. The 2009 Plan has the same goal as the 2003 Plan, but it has also added a long term goal: 'to ensure that by 2020 the quality of water entering the Reef from adjacent catchments has no detrimental impact on the health and resilience of the GBR.[80] Specific targets adopted in the 2009 Plan include reductions in nitrogen and phosphorus loads at the end of catchments by at least 50 per cent, and similarly specific targets are also established for maintaining minimum groundcover levels on grazing land; adoption of land management practices; preserving natural wetlands; and improving riparian areas. Australian

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73 State of Queensland and Commonwealth of Australia, *Reef Water Quality Protection Plan: For Catchments Adjacent to the Great Barrier Reef World Heritage Area* (Queensland Department of Premier and Cabinet, 2003) 2 (*2003 RWQPP*).

74 Ibid 6.

75 Ibid 7.

76 Ibid 8.

77 J Brodie (comp), 'Nutrient Management Zones in the Great Barrier Reef Catchment: A Decision System for Zone Selection' Nutrient Management Zones (NMZ) Technical Report, Report to the Department of the Environment and Heritage (Report No 06/07, Australian Centre for Tropical Freshwater Research, 2007).

78 State of Queensland (Department of Premier and Cabinet), *2009 RWQPP*, above n 5, 5.

79 Ibid.

80 Ibid 14.

Government funding for the implementation of this Plan is also from its *Caring for our Country* initiative.

Regional natural resource management bodies and industry have worked closely with the government in implementing the *Reef Water Quality Protection Plans* and the *Caring for our Country* program. The roles of natural resource management regional bodies include the setting of water quality targets, and providing education and information and capacity building services for landholders. Industry has developed voluntary property and business level management processes, codes of practice, information and guidelines to support the identification and management risks to the environment created by agricultural practices, including those that impact on water quality. All of these industry programs are voluntary.

Arguably, significant progress has been made under both the *Caring for our Country* (and its predecessor the NAPSWQ) and the *Reef Water Quality Protection Plan* programs. For example, progress has included the establishment of administrative frameworks to support intergovernmental and multi-agency cooperation; the establishment of regional NRM bodies to work in partnership with industry and landholders to encourage and support improved farm management practices; engagement of industry and their work to develop best practice management processes, guidelines, information and support for landholders; provision of extension, education, information and training services; setting of water quality targets for regions and the development of regional water quality improvement plans; on-ground actions by landholders funded by one-off grants, that aim to protect and improve water quality; and improved integrated monitoring, modelling and reporting of water quality. Many of these activities are known to contribute towards successful water quality outcomes; however, as indicated in the 2009 RWQPP, there is no evidence to date that these approaches have actually achieved improved water quality outcomes, and there is an identified need for regulation 'where there is a risk that voluntary approaches will fail to deliver significant water quality improvements'.[81] The 2003 RWQPP identified the need to use the existing 'wide range of regulatory powers ... to complement and support self-management and cooperative partnership approaches'.[82] These existing regulatory powers are outlined and discussed in further detail below.

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81 State of Queensland (Department of Premier and Cabinet), *2009 RWQPP*, above n 5, 21.

82 Ibid.

2 *Commonwealth Government Legislation Relevant to Water Quality and the Great Barrier Reef*

(a) *Great Barrier Reef Marine Park Act 1975* (Cth)

The main object of the *Great Barrier Reef Marine Park Act 1975* (Cth)[83] 'is to provide for the long term protection and conservation of the environment, biodiversity and heritage values of the GBR Region'.[84] The Act provides for the establishment of the Great Barrier Reef Marine Park,[85] and the Great Barrier Reef Marine Park Authority (GBRMPA) as its key management agency; zoning plans and zones of management within the Marine Park; and it also 'facilitates a collaborative approach to management of the Great Barrier Reef World Heritage Area (GBRWHA) with the Queensland government'.[86] The GBRMPA has played a key role in increasing knowledge and raising awareness about water quality issues impacting on the GBR and the role of diffuse water pollution from agriculture, through its investment in, and coordination of, research and information dissemination. It has also engaged and fostered partnerships between industry, research, and government to address this issue. Olsson et al argues that the GBRMPA has been 'crucial in initiating the transition to ecosystem-based management' needed to address the challenge of diffuse water pollution from agriculture facing the GBR.[87]

Although the *Great Barrier Reef Marine Park Act 1975* (Cth) ('*GBR Marine Park Act*') and GBRMPA focus primarily on the management of the Marine Park itself, there is provision under this Act to regulate or prohibit 'acts (whether in the Marine Park or elsewhere) that may pollute water in a manner harmful to animals and plants in the Marine Park'.[88] This is a provision that was used by the Commonwealth to develop the *Great Barrier Reef Marine Park (Aquaculture) Regulations 2000*, which 'makes it an offence to discharge aquaculture waste into waters of the part of the GBR Region that is not in the Marine Park, or into streams that discharge into the GBR region'.[89] Brodie argues that the Commonwealth, or the GBRMPA as its agent, has not used this provision to regulate diffuse water pollution from agriculture impacting on the Marine Park, and instead the GBRMPA 'has relied on Queensland regulatory processes to

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83 *Great Barrier Reef Marine Park Act 1975* (Cth) (as amended up to Act No 5 of 2011).

84 Ibid s 2A(1).

85 Including definition of the GBR Region in sch 1 of the Act.

86 Ibid s 3(f).

87 Per Olsson, Carl Folke and Terry P Hughes, 'Navigating the Transition to Ecosystem-Based Management of the Great Barrier Reef, Australia' (2008) 105(28) *Proceedings of the National Academy of Sciences* [of the United States of America] 9489, 9489.

88 *Great Barrier Reef Marine Park Act 1975* (Cth) s 66(2)(e).

89 *Great Barrier Reef Marine Park (Aquaculture) Regulations 2000* (Cth) Introductory text.

control discharges into the waters of the GBRMP and GBRWHA'.[90] This is likely to be due to the established partnerships between the Commonwealth and Queensland governments to address diffuse water pollution via initiatives such as NAPSWQ, *Caring for our Country* and the RWQPP. The challenge of addressing diffuse water pollution through regulations under the *GBR Marine Park Act* is much more complex than the creation of a regulation for a single industry such as aquaculture. Constitutional matters in relation to state responsibilities for land and water resource management, and the administrative burden that is likely to have been created by attempting to regulate diffuse water pollution from agriculture impacting on the Marine Park under this provision, are likely to have created significant disincentives to the Commonwealth for pursuing this option. Whilst these constitutional matters and constraints are worthy of further investigation, this analysis is beyond the scope of this paper.

(b) *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (*'EPBC Act'*) is the Commonwealth Government's central piece of environmental legislation. The objects of this Act include 'to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance'; and 'to assist in the co-operative implementation of Australia's international environmental responsibilities'.[91] The *EPBC Act* provides the basis for the Commonwealth environmental Minister 'to decide whether an action that has, will have, or is likely to have, a significant impact on certain aspects of the environment should proceed'.[92] These 'aspects of the environment' are identified in the Act as 'matters of national environmental significance'. Initially, the GBR was protected under the *EPBC Act* as a World Heritage Listed Area and, in 2009, the GBR Marine Park was listed as a matter of national environmental significance. As a consequence, any action taken within, or outside of, the GBR Marine Park that will have, or is likely to have, a significant impact on the GBR Marine Park, is subject to the approvals processes required under the *EPBC Act*. There is currently being conducted under the *EPBC Act* a 'strategic assessment'[93] of the Great Barrier Reef World Heritage Area and adjacent coastal zone to 'help identify, plan for and manage existing and emerging risks so that the unique environmental values of the GBR are protected and managed'.[94]

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90 Jon Brodie, 'Keeping the Wolf from the Door: Managing Land-Based Threats to the Great Barrier Reef', (2000) *Proceedings 9th International Coral Reef Symposium, Bali, Indonesia 23–27 October 2000: vol 2,* 705.

91 *Environment Protection and Biodiversity Conservation Act 1999* s 3(1)(a)–(g).

92 Ibid s 11.

93 Ibid s 146.

94 Australian Government, Department of Sustainability, Environment, Water Population and Communities, *Strategic Assessment – Great Barrier Reef*, Department of Sustainability,

Given the significant impact that diffuse pollution from agriculture has, and is likely to have, on the GBR Marine Park, it could be argued that agricultural activities contributing to diffuse water pollution in adjacent catchments should trigger the approvals processes required under the *EPBC Act*. However, as outlined earlier in this article, difficulties arise in terms of the measurement of emissions of diffuse water pollution and their attribution to a single person, property or entity. Also, the impacts of diffuse water pollution on the GBR are due to the accumulation of diffuse water pollution from many sources, which individually may not be causing or likely to cause significant impact on the environment. In *Minister for the Environment and Heritage v Greentree,*[95] the clearing and ploughing of a Ramsar listed wetland was found to have had a significant environmental impact on a matter of national environmental importance; this activity and its impact could be easily observed and attributed to a property and to a person. *Booth v Bosworth*[96] was different in that the action (killing of flying foxes) *outside* (albeit close to) a World Heritage Area was found to be likely to have a significant impact on the world heritage listed values of the adjacent Wet Tropics World Heritage Area; however, in this instance the ability to quantify the number of flying foxes killed formed an important part of the case brought to the Court seeking an injunction under the *EPBC Act* to cease the activity.

Queensland Conservation Council v Minister for the Environment and Heritage (the '*Nathan Dam Case*')[97] is a landmark case under the *EPBC Act* that does deal specifically with the impact of diffuse water pollution from agriculture on the GBR. This case related to a proposal for the Nathan Dam to be built on the Dawson River, one of the tributaries of the Fitzroy River, which drains into the Great Barrier Reef lagoon. This case dealt with the scope of consideration required by the Minister during the impact assessment and approvals process. The Court held that the Minister must consider both the direct impact that the construction and operation of the dam was likely to have on three listed threatened species and on certain threatened ecological communities,[98] and also the *indirect* impact that agricultural development enabled by the construction of this dam would have on GBR water quality. The precedent set by the *Nathan Dam case* means that, under the *EPBC Act*, a new development in the GBR catchments that will, or is likely to, increase diffuse water pollution impacts on

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Environment, Water Population and Communities (28 September 2012) <http://www.environment.gov.au/epbc/notices/assessments/great-barrier-reef.html>.

95 *Minister for the Environment and Heritage v Greentree* (No 3) (2004) 136 LGERA 89.

96 *Booth v Bosworth* (2001) 114 FCR 39.

97 *Queensland Conservation Council v Minister for the Environment and Heritage* [2003] FCA 1463, affirmed in *Minister for the Environment and Heritage v Queensland Conservation Council Inc* (2004) 139 FCR 24.

98 *Queensland Conservation Council v Minister for the Environment and Heritage* [2003] FCA 1463 (19 December 2003).

the GBR, could trigger the *EPBC Act*'s assessment and approvals process. However, it is unlikely that existing agricultural activities contributing towards the impacts of diffuse water pollution on the Reef will ever be assessed as a 'controlled action' under the *EPBC Act*.

3 *Queensland Government Legislation Relevant to Water Quality and the Great Barrier Reef*

(a) *Environmental Protection Act 1994* (Qld)

Prior to the commencement of the *Great Barrier Reef Protection Amendment Act 2009* (Qld), McGrath argued that 'agricultural runoff remains virtually unregulated in practice in Queensland'.[99] However, this does not mean that the *power* to regulate diffuse water pollution under existing legislation did not exist. Arguably, considerable power to regulate diffuse water pollution existed under the *Environmental Protection Act 1994* (Qld) (*'EP Act'*) prior to its amendment by the *Great Barrier Reef Protection Amendment Act 2009,* so it is useful to examine what these powers were, why they were not used, or were not adequate in managing diffuse water pollution from agriculture impacting on the Reef and, therefore, why it was necessary to introduce the new legislative reef protection amendments.

The *EP Act* is the central piece of environmental legislation in Queensland. The object of this Act is to: 'protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends'.[100] Under this Act, a 'general environmental duty' is required which specifies that: 'a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm'.[101] Environmental harm is defined in the Act as 'any adverse effect, or potential adverse effect ... on an environmental value',[102] and environmental harm can be caused as a direct or indirect result of an activity, or from an activity alone, or as a result of an activity and other activities or factors.[103] The scope of this Act is, therefore, very broad and, although in practice it is currently primarily used to regulate point source pollution and contamination,[104] it does have the capacity to regulate all activities resulting in environmental harm. A number of cases demonstrate this point. For

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99 McGrath, above n 4, 216.
100 *Environmental Protection Act 1994* (Qld) s 3.
101 Ibid s 319(1).
102 Ibid s 14(1).
103 Ibid s 14(2)(a)–(b).
104 McGrath, above n 4, 89.

example, the decision in *Caloundra City Council v McCreath*[105] found that excavation works that altered the natural flow of a waterway had caused environmental harm. In *Maroochy Shire Council v Barnes,*[106] tree clearing was found to have caused environmental harm. Clearly, there is capacity under this Act to regulate diffuse pollution if an activity causing it were found to result in environmental harm.

The key constraint in using the powers of the *EP Act* to regulate diffuse water pollution relate to the nature of diffuse water pollution itself. The inability to quantify 'emissions' accurately and the cumulative nature of diffuse water pollution impacts make it very difficult to quantify and prove that agricultural activities on an individual property will, or will likely, result in environmental harm to the GBR. In considering whether or not a person had met their general environmental duty, regard would also need to be given to 'the nature of the potential harm, the sensitivity of the receiving environment, the current state of technical knowledge, the likelihood of the success of proposed measures, and financial implications'.[107] Under the *EP Act*, a person can demonstrate that they have complied with the general environmental duty if they have undertaken an activity in accordance with an 'approved code of practice'.[108] Codes of practice (which are not specific to mitigating diffuse water pollution) have been developed for a number of industries, including cane growing and dairy farming. Adoption of these codes of practice is not mandatory, although the ability to demonstrate environmental duty of care may act as an incentive for producers to adopt these codes.

The *EP Act* also provides for the development of a number of regulatory tools, including 'environmental protection policies',[109] which, once accepted, become subordinate legislation. An example is the *Environmental Protection (Water) Policy 2009* (Qld) that (amongst other things) states water quality guidelines and objectives for Queensland waters. This Policy deals specifically with sewage management, urban stormwater quality management, and trade waste management, with a focus on providing a regulatory framework for local government and sewerage service providers. Whilst this Policy does not specifically address diffuse pollution from agriculture and its impact on water quality, it does provide mechanisms for setting water quality targets and guidelines, and monitoring and reporting which are useful tools for diffuse water pollution management. Prior to the introduction of the *Great Barrier Reef Protection Amendment Act 2009* (Qld), it was argued[110] that the *Environmental*

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105 *Caloundra City Council v McCreath* [1998] QPELR 178.
106 *Maroochy Shire Council v Barnes* [2001] QPELR 475.
107 *Environmental Protection Act 1994* (Qld) s 319(2)(a)–(e).
108 Ibid s 14.
109 Ibid ss 26–34.
110 For example, McGrath, above n 4, 217.

Protection (Water) Policy could be revised to address management of diffuse water pollution from agriculture, for example by extending water quality target setting to include all GBR catchments, and to include requirements such as protection of riparian zones, and development farm management plans,[111] however, the option of revising this Policy for this purpose was not adopted.

(b) *Other Relevant Queensland Legislation*

Subject to changes that the new Queensland Government may introduce,[112] the Queensland Government has other pieces of existing legislation that collectively put in place a number of measures that regulate land use and development in the GBR catchment,[113] and in doing so, do address some activities known to exacerbate the emissions of diffuse water pollution into waterways. For example, the *Vegetation Management Act 1999* (Qld) and the *Sustainable Planning Act 2009* (Qld) address broad scale land clearing in Queensland by establishing a vegetation mapping, assessment and approvals systems for clearing vegetation. Retention of groundcover is important in managing soil erosion and loss of soil from catchments, and it also plays a role in filtering and trapping nutrients, which can also lead to a reduction in nutrient loads entering waterways. The *Water Act 2000* (Qld) does not explicitly deal with diffuse water pollution from agricultural runoff. However, the planning and monitoring processes required under this Act have the potential to inform and contribute towards ecosystem based management approaches for diffuse water pollution. The *Land Act 1994* (Qld) requires a duty of care to the land by users of state owned land, for example by conserving soil and water resources, and protecting riparian vegetation.[114] Finally, Queensland's relevant planning and development legislation: the *Coastal Protection and Management Act 1995* (Qld) and the *Sustainable Planning Act 2009* (Qld) provide frameworks for planning and development processes that can be used to address diffuse water pollution in GBR catchments. An example of this is the development of the *State Planning Policy 4/11: Protecting Wetlands of High Ecological Significance in the Great Barrier Reef Catchments,* which is subordinate legislation under the *Sustainable Planning Act 2009* (Qld). This policy seeks to protect ecosystem services, such as the filtering of pollutants, provided by wetlands of high ecological significance in GBR catchments.[115] Whilst further analysis of the powers available to regulate

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111 Ibid.

112 Note, in particular, a Parliamentary Committee is currently inquiring into reducing the regulatory burden to agriculture and mining: see Queensland Parliament, *Inquiry into Queensland Agriculture and Resource Industries* <http://www.parliament.qld.gov.au/work-of-committees/committees/AREC/inquiries/current-inquiries/QldARindustries >.

113 McGrath, above n 4, 193.

114 *Land Act 2004* (Qld) s 199(b)–(d).

115 Took effect 25 November 2011. Department of Environment and Resource Management (Qld), *State Planning Policy 4/11: Protecting Wetlands of High Ecological Significance in*

diffuse water pollution (or activities that potentially contribute to, or mitigate, diffuse water pollution) under this existing legislation is outside of the scope of this article, it is useful to be aware of Queensland's broader legislative framework relevant to this issue when considering the introduction and likely effectiveness of the measures enacted by *Great Barrier Reef Protection Amendment Act 2009* (Qld).

III QUEENSLAND'S GREAT BARRIER REEF PROTECTION AMENDMENT ACT 2009: AN ANALYSIS

Although significant action had been taken by the Queensland and Commonwealth governments over the previous decade to address the issue of declining water quality in the GBR lagoon due largely to diffuse water pollution from agriculture, by 2009 it had become apparent that this action had not been sufficient in halting declines in the quality of water discharged to the Reef.[116] In addition to endorsement by the Queensland and Australian governments for the revised *Reef Water Quality Protection Plan 2009* (Qld), the Queensland Government took the additional step of introducing legislation that regulates certain activities in three high priority catchment areas: the Burdekin Dry Tropics, Mackay-Whitsunday and Wet Tropics Catchments (see Figure 2).

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the Great Barrier Reef Catchments <http://www.ehp.qld.gov.au/ecosystems/wetlands/pdf/wetlands-spp.pdf>.

116 State of Queensland (Department of Premier and Cabinet), *2009 RWQPP*, above n 5.

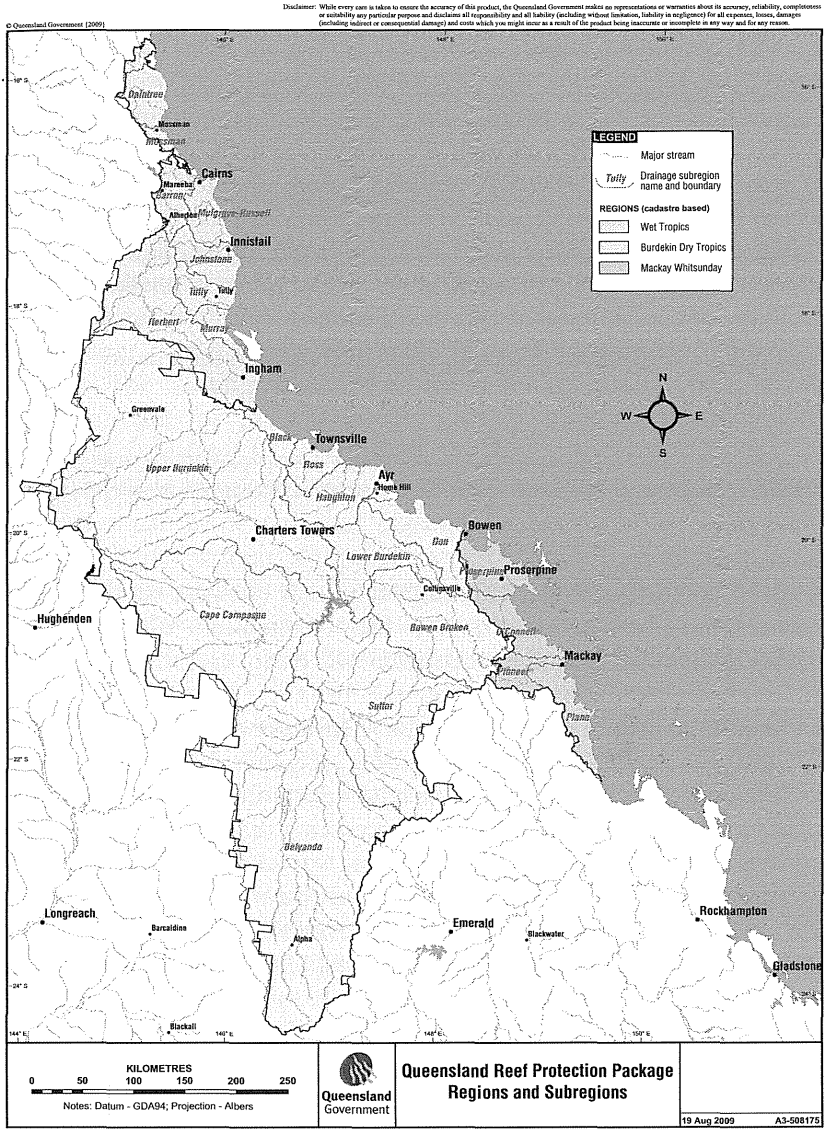

FIGURE 2: PRIORITY CATCHMENTS UNDER THE *GREAT BARRIER REEF PROTECTION AMENDMENT ACT 2009* (SOURCE: QUEENSLAND GOVERNMENT)[117]

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117 This map is reproduced here with the permission of the Queensland Government. It was originally captioned 'Map of Catchments Affected by the Legislation' (19 August 2009). It is accessible at: Queensland Government, *The Great Barrier Reef* (16 February 2012) Reef Wise Farming <http://www.reefwisefarming.qld.gov.au/information/greatbarrierreef.html>.

A *Overview of the Great Barrier Reef Protection Amendment Act 2009 (Qld)*

On 1 January 2010, the Great Barrier Reef Protection Amendment Act 2009 (Qld) came into effect, amending the Chemical Usage (Agricultural and Veterinary) Control Act 1988 (Qld)[118] and the Environmental Protection Act 1994 (Qld)('Reef Protection Legislation'). [119] The key amendments are found in a new ch 4A inserted into the Queensland Environmental Protection Act 1994, titled 'Great Barrier Reef protection measures'.[120] The purpose of ch 4A is to:

> (a) reduce the impact of agricultural activities on the quality of water entering the reef; and
>
> (b) contribute to achieving the targets about water quality improvement for the reef under agreements between the State and Commonwealth from time to time.[121]

This purpose is primarily achieved through the main changes resulting from this Reef Protection Legislation; namely, the designation of 'prescribed agricultural ERA products' and the regulation of their use in 'agricultural environmentally relevant activities' (agricultural ERAs).[122]

The amendments to the *Chemical Usage (Agricultural and Veterinary) Control Act 1988* (Qld) include the definition of a 'prescribed agricultural ERA product', which is an agricultural chemical product declared by regulation as an agricultural ERA. A regulation may also 'prescribe conditions for using, preparing, storing and possessing the product for carrying out an agricultural ERA'.[123] A person may also propose alternative ways of complying with conditions for use, preparation, storage and possession of an agricultural chemical product in an accredited Environmental Risk Management Plan

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118 Amendments to the *Chemical Usage (Agricultural and Veterinary) Control Act 1988* comprised (with the relevant section of the Amending Act in brackets): new pt 2, div 3, sdviv 1 and sdiv 2 heading (s 2B); s 13A (s 2C), new pt 2, div 3, sdiv 3 (s 2D); amendment of sch (Dictionary) (s 2E).

119 There were also amendments to the *Integrated Planning Act 1997* (Qld) s 1.3.5, schs 8, 10; *Sustainable Planning Act 2009* (Qld) s 10.

120 *Environmental Protection Act 1994* (Qld) as amended by the *Great Barrier Reef Amendment Act 2009* (Qld) s 74. Chapter 4A comprises ss 74–105. Other amendments involved ss 18, 19, 320, 346, 358, 363A, 452, 258, 490, 493A, 520, 538, 540, insertion of new ch 13 pt 13, and amendment of schs 2, 4.

121 Ibid s 74(a)–(b). Note: the current agreement referred is the *2009 RWQPP.*

122 Ibid ss 18–19.

123 *Chemical Usage (Agricultural and Veterinary) Control Act 1988* (Qld) as amended by the *Great Barrier Reef Protection Amendment Act 2009* (Qld) ss 12W, 13C(1)(b).

(ERMP).[124] The Minister can only make a regulation if it is considered necessary or desirable to help achieve the Great Barrier Reef protection measures.[125]

An activity is an agricultural ERA if it is commercial sugar cane growing or cattle grazing on properties greater than 2000ha; and, if this activity is carried out in one or more of three priority catchment areas shown in Figure 2. These are the areas indicated in Figure 2 as 'Wet Tropics', 'Burdekin Dry Tropics' and 'Mackay Whitsunday'. Clarification is provided for properties only partly within one or more of the priority catchments.[126]

Under the new ch 4A of the *EP Act,* two key mechanisms are used to regulate diffuse water pollution from agriculture: regulation of the application (that is, input rather than emissions) of nitrogen and phosphorus; and requirements for ERMPs. The starting point for all agricultural ERAs is that it is an offence to apply nitrogen or phosphorus to soil on a relevant property,[127] unless the following conditions have been met:

- 'Conditions to prevent over-fertilisation': anyone carrying out an agricultural ERA must work out the 'optimum amount' of nitrogen and phosphorus application for their particular property. 'Optimum amount' is defined under the Act as meaning 'the highest amount of nitrogen and phosphorus that can be applied without over-fertilising the property'.[128] The optimum amount must be worked out using soil tests conducted by an appropriately qualified person, and a soil testing report must be prepared that shows its results, including the calculated 'optimum amount'.[129] Regulations can also prescribe the intervals at which testing must take place and the methodology to be used for working out the optimal amount. The application of fertiliser containing nitrogen and phosphorus on a relevant property must not exceed the optimum amount.[130]
- As an alternative to the condition above, a person may have an accredited ERMP for the agricultural ERA, which 'provides an alternative procedure to prevent over-fertilisation of the property'.[131]

Those undertaking an agricultural ERA are required to keep detailed records that include the details of the required soil tests and results, including the optimum amount; any agricultural chemicals, fertilisers and soil conditioners

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124 Ibid s 13D(1).

125 Great Barrier Reef protection measures: ch 4A *Environmental Protection Act 1994* (Qld) as amended by the *Great Barrier Reef Protection Amendment Act 2009* (Qld).

126 Great Barrier Reef protection measures: ch 4A *Environmental Protection Act 1994* (Qld) as amended by the *Great Barrier Reef Protection Amendment Act 2009* (Qld) s 75.

127 Ibid s 78.

128 Ibid s 77.

129 Ibid ss 80–81.

130 Ibid ss 81–82.

131 Ibid s 78.

applied on a relevant agricultural property; and any other details that may be prescribed under a regulation.[132]

In addition to the requirements on persons undertaking an agricultural ERA, an ERMP must be prepared by a person who carries out an agricultural ERA if it consists of:

(a) sugar cane growing on more than 70 hectares in the Wet Tropics catchment; or
(b) cattle grazing[133] on more than 2000 hectares in the Burdekin dry tropics catchment.[134]

The Minister may also direct a person carrying out an agricultural ERA to complete an accredited ERMP if it is considered 'necessary or desirable' to improve water quality, or to avoid unlawful environmental harm.[135]

ERMPs must contain details of the property and the agricultural ERA being carried out, and the person carrying out the agricultural ERA. It must also:

1. identify any hazards on the property that may cause the release of contaminants into water entering the reef (examples given are: fertiliser or agricultural chemicals, erosion zones, low levels of groundcover);
2. include measurable targets and performance indicators for improving the quality of water being discharged from the property;
3. include a management plan for the agricultural ERA that provides for the management of:
   i. the application of agricultural chemicals on the property; and
   ii. nutrients applied to the soil on the property (noting that if the agricultural ERA subject to an ERMP is cattle grazing, this requirement only applies to that part of a cattle grazing property where pastures are fertilised);[136] and
   iii. sediment loss from the property, including the management of ground cover and erosion zones to prevent sediment loss.[137]

The ERMPs must also include any information required under a direction given by the Minister; any information required by an environmental protection policy or a regulation; and, a general requirement to provide information 'for any matter that is reasonably necessary to reduce the impact of the agricultural ERA on the quality of water entering the Reef'.[138] There is flexibility allowed in the

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132 Ibid s 83.

133 Where, for the purposes of this requirement, cattle grazing refers to an 'agricultural property carrying more than 100 standard cattle units'. For measurements for standard cattle units, see *Environmental Protection Act 1994* (Qld) as amended by the *Great Barrier Reef Protection Amendment Act 2009* (Qld) ss 87A(1), 87A(4).

134 *Environmental Protection Act 1994* (Qld) as amended by the *Great Barrier Reef Protection Amendment Act 2009* (Qld) ss 88(a)(i)–(ii).

135 Ibid ss 89(a)(i)–(ii).

136 As outlined in the 'exceptions for management plan requirement': ibid s 95(2).

137 Ibid ss 94(a)–(d).

138 Ibid ss 94(e)–(g).

development of the ERMPs, including that the ERMP content requirements can be met in the provision of any number of other documents (which may have been prepared for another purpose) that meet the requirements of an ERMP.[139] Until the administering authority accredits an ERMP, it has no effect. If accreditation is denied, the ERMP must be amended to address reasons for this decision and then resubmitted for accreditation. Once an ERMP is accredited, the person holding the accredited ERMP can amend it at any time (re-accreditation will be required), and the administering authority can also give written direction for the amendment of an ERMP for a number of specified reasons.[140] Persons undertaking an agricultural ERA with an accredited ERMP must report annually to the administering body on the implementation of the ERMP. Compliance with an approved ERMP can be used as a defence or proof by a person that they have met the general environmental duty.[141]

In summary, the key actions required under the Reef Protection Legislation by persons carrying out an agricultural ERA are listed below:

- All commercial sugar cane growers, and cattle graziers on properties of more than 2000 hectares, in 'priority catchments' (Wet Tropics, Mackay-Whitsunday, and Burdekin) must not apply fertiliser until they have had soil tests conducted by a suitably qualified person, and worked out the 'optimum amount' of fertiliser application. They must then not exceed application beyond this optimum rate. Records must be kept of soil tests, optimum amount calculations and fertilisation application. A regulation may prescribe the regularity and methodology required for soil testing.
- In addition to the requirements above, properties greater than 70 hectares growing sugar cane in the Wet Tropics catchment; cattle grazing properties greater than 2000 hectares in the Burdekin catchment; and any person carrying out an agricultural ERA receiving a direction from the Minister, is required to have an accredited environmental risk management plan (ERMP) and report annually on its implementation.
- Agricultural chemical products can be declared as a prescribed agricultural ERA product and any person using, storing, preparing or possessing such a product must comply with a prescribed agricultural ERA condition for the product, or an accredited ERMP that specifies alternative approaches to meet compliance conditions.

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139 Ibid s 96.
140 Ibid s 104.
141 Ibid s 14(4).

B *Analysis of the Great Barrier Reef Amendment Act 2009: Its Approach, Likely Effectiveness, Gaps and Opportunities*

The Reef Protection Legislation is intended to provide a 'regulatory structure to reduce the impact of agricultural activities on the quality of water entering the Great Barrier Reef and to contribute towards achieving targets under agreements between the State and Commonwealth'.[142] Although it's too early to assess whether or not water quality targets are likely to be met, or the contribution of this legislation towards meeting those targets, it is possible to assess the regulatory structure established, and its likely effectiveness.

1 *Progress to Date: Uptake, Administration and Compliance*

The Reef Protection Legislation commenced on 1 January 2010 and, since then, there has been an apparent rapid rollout of the 'Reef Wise Farming' program to implement this legislation. The Queensland Government is investing $50 million over five years to support the implementation of the legislation, including program implementation costs, extension services, monitoring and compliance and enforcement costs. As part of the provision of these extension services, the Government has appointed a number of 'reef protection officers' across the region to provide advice and support to persons undertaking agricultural ERAs and developing ERMPs. In the early stages following the commencement of the legislation, industry bodies commented that the 'Government has a strict timetable and has stuck to it',[143] referring to both the development and implementation of the legislation. During the development phase, industry was concerned that the Government had not allowed enough time for consultation and, once the legislation commenced, they expressed concern that the government was struggling to recruit reef protection officers, and was, therefore, ill-prepared to implement the 'looming Reef Protection laws'.[144] Reef protection officers are now in place, and the Government has doubled the original number of intended extension staff from five to ten, demonstrating a commitment to providing adequate support to producers required to submit an ERMP for accreditation by the due date.[145] The commitment to adequately

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142 State of Queenlsand,'Explanatory notes for the *Great Barrier Reef Amendment Bill 2009* (Qld)' (2009) 1 <http://www.legislation.qld.gov.au/bills/53PDF/2009/GBReefProAB09exp.pdf>.

143 AgForce, *Reef Regulations* (2012) Advancing Rural Queensland <www.agforceqld.org.au/index.php?page_id=31>.

144 Adam Stephen, *Canegrowers: DERM Struggling to Recruit Reef Protection Officers* (22 December 2009) ABC Rural <www.abc.net.au/rural/qld/content/2009/12/s2778614.htm>.

145 Queensland Government, 'Extra Help for ERMPs' *ReefWise Newsletter*: Reefwise Update no 2 (September 2010) Queensland Government <www.reefwisefarming.qld.gov.au/pdf/reefwise-news.pdf>.

resource the implementation of the legislation, and a willingness to increase resources where required, are positive steps towards effective implementation.[146]

To date, approximately 560 ERMPs have been received for accreditation from sugar cane growers in the Wet Tropics catchments, and 600 ERMPs have been received from cattle graziers in the Burdekin dry tropics.[147] This is consistent with the initial estimates for operators required to prepare ERMPs,[148] so these figures indicate a high level of compliance by farmers in the *submission* of ERMPs. It will not be possible to get an idea about whether or not targets and performance measures identified under the ERMPs are being met until the annual reporting information is received, collated and verified. As for the rest of the operators who are undertaking agricultural ERAs (but are not required to submit an ERMP), there is no information available about the level of compliance with soil quality testing and calculation of the 'optimum amount' of fertiliser application. However, a program of reviews is currently underway to ensure soil testing and record keeping requirements are being met.[149] Good information, awareness raising, and technical assistance are critical to the success of programs designed to manage and regulate diffuse water pollution.[150] The implementation of the Reef Protection Legislation has been supported by the development of: a website; a nutrient calculator; a methodology for soil sampling and analysis for sugar cane properties; a mapping service for properties in the priority catchments; an ERMP example and template; and a number of other guides and methods, forms, fact sheets, technical advisory notes, as well as a regular newsletter, all developed to support implementation of the legislation.[151]

A number of prescribed agricultural products, or chemicals, have been declared, along with mandatory requirements for their use, storage and preparation. The declaration of these chemicals, and the requirements for their use, was made in the *Chemical Usage (Agricultural and Veterinary) Control Regulation 1999* and then subsequently amended in response to concerns from cane growers and representative industry bodies.[152] The focus for activity since the commencement has necessarily been program establishment, with the

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146 Brull, above n 28, 221–49.

147 Personal communication, Doug Yuille, Queensland Government Department of Environment and Resource Management. Telephone Interview, 15 June, 2011.

148 State of Queensland, 'Explanatory notes for the Great Barrier Reef Amendment Bill 2009 (Qld)', above n 142.

149 Personal communication, Doug Yuille, Department of Environment and Resource Management, Telephone Interview, 15 June 2011.

150 Such as Nelson, above n 9, 381; and Novotny and Olem, above n 32, 689–710.

151 The Queensland Government has developed a dedicated website 'Reef Wise Farming' (<www.reefwisefarming.qld.gov.au>) to support the implementation of the *Great Barrier Reef Amendment Act 2009* (Qld). This website provides the information, templates, forms and tools mentioned here.

152 Queensland Government, *Chemicals* (15 January 2012) ReefWise Farming <www.reefwisefarming.qld.gov.au/information/chemicals.html>.

development of ERMPs and the declaration of prescribed agricultural products, and regulations for their use, a priority during this phase. The focus will now presumably turn to compliance and enforcement, with the development of a compliance strategy currently underway.[153] This strategy is likely to take into consideration political and environmental issues facing the region,[154] and ideally will be developed in consultation with industry bodies to build acceptance and support within industry.

2 *Regulating Agricultural Nutrient Inputs: Method, Priorities and Costs*

The regulatory structure established by the new Reef Protection Legislation is innovative and has a number of strengths. This includes the measurement and regulation of agricultural *inputs* (that is, the application of fertiliser and chemicals) rather than the measurement of diffuse water pollution into waterways, which, as discussed in Part 1 of this article, has been found to be impractical and virtually impossible to regulate. It is estimated that of the 150 000 tonnes of fertilisers used annually in the GBR catchments, approximately 32 000 are lost to the environment each year.[155] In order to limit these losses, soil testing is mandatory under the Reef Protection Legislation for anyone undertaking an agricultural ERA who plans to apply fertiliser containing phosphorus or nitrogen. The results of this soil testing must then be used to calculate the 'optimum amount' for fertiliser application at a particular property. It is yet to be seen how this program will be fully implemented and enforced, with compliance details over the longer term (such as regularity of testing) yet to be determined for those persons not required to have an ERMP. Whilst there has been landholder and industry resistance to this legislation, there are potentially considerable economic advantages to the property owner in limiting nutrient inputs to optimum levels. Having this mandatory requirement for soil quality testing will have the advantage of informing the producer of the nutrient requirements of the soil, and allowing them to avoid costly losses. The requirement to undertake soil testing, calculation of optimum amount, and to have an accredited ERMP is much simpler to regulate than setting and regulating emissions targets. It is also obvious that the Queensland Government has sought to engage and work in partnership with industry, demonstrated by a number of amendments made in response to industry concerns.

A 'nutrient quotas' approach, similar to the 'optimum amount' measure used in the Reef Protection Legislation, has been successfully adopted in The

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153 Personal communication, Doug Yuille, Department of Environment and Resource Management, Telephone Interview, 15 June 2011.

154 Ibid.

155 State of Queensland, 'Explanatory notes for the Great Barrier Reef Amendment Bill 2009 (Qld)', above n 142, 4.

Netherlands, Belgium and Denmark.[156] It has been argued that, while the costs of establishing new administrative systems to support establishment and implementation of this approach are likely to be excessive, mandatory quotas have the potential to be an 'extremely effective policy instrument'.[157] The success of this approach in these countries is largely attributed to a pre-existing program of monitoring and recording of agricultural inputs, which avoided the cost and administrative burden of establishing new systems to support implementation.[158] The risk-based management approach of the Reef Protection Legislation seeks to address this issue by prioritising regulatory effort and maximising cost effectiveness within resource constraints. Specifically, this has been done by limiting regulation to the three highest priority catchments, and to the two agricultural sectors (sugar cane and cattle) that 'contribute the highest levels of chemicals and sediment in Reef waters';[159] adopting standard minimum requirements for all properties where possible; and by providing the ability to target additional 'hot spot' areas requiring an ERMP (limited to persons carrying out an agricultural ERA). The use of existing legislative frameworks provided by the *Environmental Protection Act 1994* (Qld) and the *Chemical Usage (Agricultural and Veterinary) Control Act 1988* (Qld) also delivers administrative efficiencies.[160]

3 *Environmental Risk Management Plans*

As outlined previously, in addition to regulating agricultural inputs, the legislation requires the development of environmental risk management plans. ERMPs are used in a number of ways: to plan and regulate improved farm management practices for highest priority activities; to enable the Minister to require an ERMP for additional 'hot spot' areas (where an agricultural ERA is being carried out); and to provide an alternative to persons not able to comply with mandatory requirements for the use of a prescribed agricultural product, or an alternative method for soil testing required to calculate the optimum amount for fertiliser application. An ERMP requires identification of water contamination 'hazards', and must include measurable targets and performance indicators for water quality improvement. Furthermore, it must provide for the

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156 Gunningham and Sinclair, 'Policy Instrument Choice', above n 8, 62.

157 Ibid 66, 70.

158 Ibid.

159 State of Queensland, 'Explanatory notes for the Great Barrier Reef Amendment Bill 2009 (Qld)', above n 142, 2.

160 Ibid.

management of agricultural chemicals, fertiliser application, and reduction in sediment loss from the property.[161]

Elements such as the identification of measurable targets have been identified as a key to successful diffuse water pollution regulation.[162] The requirement to have an accredited ERMP only applies to sugar cane and cattle grazing properties over a certain size (unless a Ministerial direction for an ERMP is given to other persons) in the three high priority catchments. Capturing all properties under this categorisation, rather than having a process that selects individual properties requiring ERMPs within the high priority catchments, avoids the need to establish, implement and administer an agreed selection criteria or process for deciding on priority properties. Having mandatory requirements for ERMPs under this legislation, and building in annual reporting processes, is likely to be critical to the success of this regulatory measure, given that reliance on voluntary uptake of improved farm management practices is considered to be ineffective in achieving reductions in diffuse water pollution.[163]

One of the key features of the requirement for an ERMP is the level of flexibility that has been allowed. A document or documents produced for another purpose can be used to comply with the requirements for an ERMP; this approach seeks to reduce the cost and effort to persons required to complete an ERMP. The broad, yet non-specific, requirements under the ERMP are also more likely to result in activities that are appropriate to a particular property or area, recognising diversity across the priority catchments, and it also has the potential to foster innovation in achieving improved water quality outcomes. The downside of this approach is the potential for this regulation to disengage leading farmers who are already doing the 'right thing' voluntarily. The development of the ERMPs is supported by Reef Protection Officers, and there are templates and information provided on the reef wise farming website to support the ERMP development. This process is also supported by codes of practice, or best practice management systems and information produced by industry bodies.

4 *Gaps, Opportunities, and Potential for Further Use of Regulatory Measures*

As outlined earlier in this article, it is the cumulative impact of diffuse water pollution, potentially from many small enterprises, that presents the greatest threat to the Great Barrier Reef. The decision to target the largest emitting

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161 *Environmental Protection Act 1994* (Qld) as amended by the *Great Barrier Reef Protection Act 2009* (Qld) s 94.

162 For example, Nelson, above n 9, 381; Neil Gunningham and Darren Sinclair, 'Curbing Non-Point Pollution: Lessons for the Swan-Canning' (2004) 21 *Environmental Planning and Law Journal*, 181–99.

163 As observed widely in the literature, for example, by Gunningham and Sinclair, 'Policy Instrument Choice', above n 8; Brull, above n 28; Nelson, above n 9.

catchments and agricultural industries can be justified on the grounds of limited resources for administration and compliance; however, the threat of cumulative impacts from other catchments and agricultural industries remains. Whilst a cattle grazier on a property of over 2000 hectares in the Burdekin catchment must meet ERMP requirements, a cattle grazier in the neighbouring Fitzroy catchment faces no regulation at all for activities that may be contributing equally (or even more) towards the cumulative impact of diffuse water pollution on the Great Barrier Reef. Nor is there any scope under the Reef Protection Legislation for the Minister to give a direction requiring an ERMP *outside* of the three high priority catchment areas. Activities are not considered an agricultural ERA in the three high priority catchments if less than 75 per cent of the agricultural property is within the priority catchment, or the part of the lot within the priority catchment is less than 20 000 hectares.[164] There is no apparent justification for these criteria, and it is recommended that (regardless of any other changes) an amendment is made to remove these exemptions so that even part of properties that otherwise meet the agricultural ERA definition are subject to the regulatory measures.

An alternative approach to the inclusion of only high priority catchments, and only the two agricultural industries identified as of highest priority, namely sugar cane and cattle growing, could be to amend the definition of agricultural ERA to include all properties and industries in all GBR catchments. Exemptions could then be applied and, where appropriate, flexibility that is already built into the legislation could be used. This change would seek to ensure that the regulation addresses land uses and relative contribution to diffuse water pollution in an appropriate manner in a particular region. Built into this approach could be a general requirement for soil testing, calculation of optimum amounts, and ERMPs across the Great Barrier Reef catchments and industries with various 'levels' of priority (and concomitant increases in minimum requirements) under the ERMPs (for example, for high, medium and low priority areas). Although this approach could create a larger administrative and cost burden for the government, lessons learnt and efficiencies achieved during the implementation of the current Reef Protection Legislation could help to ensure a smoother introduction of the regulations to other regions and industries in the future if required. Any decisions to broaden the regulation of diffuse water pollution in other catchment areas would need to consider additional resources required, as well as other political, economic and social factors. For example, whilst the banana industry uses fertilisers in production, and is likely to contribute towards the impact of diffuse water pollution on the Great Barrier Reef, the government is unlikely to impose additional regulation on an currently industry seeking to recover from the devastating impacts of Cyclone Yasi in 2011.

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[164] *Environmental Protection Act 1994* (Qld) s 2(b).

Improved integration across all existing Commonwealth and Queensland government initiatives, particularly the *Reef Water Quality Protection Plan* and the *Caring for our Country* programs, with this new Reef Protection Legislation is required. Existing programs have played a key role in establishing the foundation to support the implementation of the Reef Protection Legislation; for example, by raising awareness about diffuse water pollution and its impacts; establishing extension services through the regional NRM bodies; engagement with industry; development of codes of practice, best practice management, and other standards, and information services by industry; provision of funding to support improved management practices; capacity building; and, water quality monitoring programs that will have informed (and justified the need for) the development of this legislation. There is, therefore, a significant opportunity to build on the existing frameworks and resources available under these programs to support implementation of the Reef Protection Legislation with the common goal of improved water quality outcomes for the Great Barrier Reef. Presenting an entire 'reef protection package' that includes a spectrum of measures — from voluntary to mandatory — is more likely to: reduce confusion amongst producers; demonstrate a strong and coordinated partnership approach by the Commonwealth and Queensland governments towards tackling this issue; and could ensure efficient and more effective use of funds and extension services available to support adoption of improved farm management practices, as well as compliance with the Reef Protection Legislation. The regional NRM bodies in the three high priority catchments are well placed to play a leadership role in this regard, by providing information, support and resources in a coordinated and consistent manner. It could also be beneficial to revise the *RWQPP* and *Caring for our Country – Reef Rescue Package* to include mention of the Reef Protection Legislation and to identify and provide mutually beneficial opportunities for integrated implementation of these programs.

Finally, a gap in the implementation of the Reef Protection Legislation that currently exists is information about the assessment, compliance and reporting processes for both soil quality testing and the ERMPs. A program of reviews of the record keeping required by persons undertaking an agricultural ERA, and the development of a compliance strategy, are currently underway. Clarification and information on these elements of implementation may reduce uncertainty and confusion amongst persons subject to the regulations, and will also provide a clearer picture of how effective the application of this legislation is likely to be. Information gathered as part of the annual ERMP reporting process is likely to be of significant value in better understanding the nature and management of diffuse water pollution in the region and the impact of improved land management practices on water quality. There is also potential for this information to be used to further develop diffuse water pollution management programs and to target effort and resources, including for other existing programs. There is, therefore,

significant value in exploring this opportunity further; for example, by developing a reporting framework that contributes to broader Great Barrier Reef water quality monitoring and reporting initiatives.

IV LESSONS FOR OTHER JURISDICTIONS

The challenge of managing diffuse water pollution and its impacts on the GBR provides a number of lessons for other catchments and jurisdictions. One of the primary lessons is the failure of voluntary measures to halt or reduce the emission of diffuse pollution and its impact on the Great Barrier Reef, despite significant efforts and investment at a national and state level over many years. This finding is consistent with lessons from other catchments in the US and Europe, and also from the Swan-Canning catchment in Western Australia.[165] The approach taken by Queensland's Reef Protection Legislation appears to draw on international experience in identifying key elements that should be considered by other jurisdictions seeking to regulate diffuse water pollution; namely, regulating nutrient *inputs* rather than pollution *emissions;* enhancing existing legislative, regulatory and administrative frameworks (such as the Queensland *EPA*); building on existing initiatives, including complementary voluntary measures; and taking a risk based management approach by prioritising catchments and industries to allow implementation of the legislation within administrative and funding constraints. The importance of setting targets against which the effectiveness of a policy or regulatory instrument can be measured is another important lesson for policy makers.[166]

V CONCLUSION

Policy makers and resource managers worldwide have struggled to implement effective measures to manage and regulate diffuse source pollution. Compared to the relative ease of regulating point source pollution, diffuse pollution is, by nature, difficult to measure and its impacts tend to be cumulative. Attribution of impact to an individual activity, property or person is, therefore, either difficult or impossible. Diffuse water pollution from agricultural runoff poses one of the biggest threats to the GBR. The size, complexity and diversity of the GBR ecosystem and its adjacent catchments, together with the additional and associated threat of climate change, all exacerbate challenges associated with the management of diffuse water pollution in this region. Although the Commonwealth and Queensland governments have introduced a range of

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165 Gunningham and Sinclair 'Non-point Pollution, Voluntarism and Policy Failure, above n 26, 93–104.

166 Gunningham and Sinclair, 'Curbing Non-point Pollution', above n 162, 181–99.

voluntary measures and made significant investments over the last decade to halt the decline of water quality in the GBR due to diffuse pollution from agriculture, these measures have not been effective. This prompted the Queensland Government to introduce regulatory measures through the *Great Barrier Reef Protection Amendment Act 2009* (Qld).

The literature on the management of diffuse water pollution from agriculture attests that voluntary measures alone will be unsuccessful in reducing pollution levels and that regulating the emissions of diffuse water pollution into waterways is impractical. Measures introduced under the *Great Barrier Reef Protection Amendment Act 2009* (Qld) seek to overcome this challenge by regulating agricultural *inputs*, rather than emissions, while also including mandatory requirements for improved farm management practices to achieve water quality targets. This legislation takes a risk based management approach by targeting the three highest priority catchments, and two priority agricultural industries, to ensure that the implementation of this legislation will be possible within cost and administrative constraints. The legislation appears to draw upon experiences and lessons learnt from other programs worldwide, including those in The Netherlands and the United States.

Whilst it could be argued that the power to regulate diffuse water pollution already existed under both Commonwealth and Queensland legislation, this power had not been used in practice to protect the GBR from diffuse water pollution from agriculture (with the exception of the need to consider these impacts in the *Nathan Dam case*). However, the existence of this legislation, particularly the *Environmental Protection Act 1994* (Qld), has meant that the regulatory measures for diffuse water pollution could be relatively easily introduced via amendments to existing legislation. The existing body of legislation is also very important in regulating activities that contribute towards factors either exacerbating or mitigating diffuse water pollution, including broad scale land clearing, land development, water resource management and protection of wetlands, all of which complement the measures introduced under the *Great Barrier Reef Protection Amendment Act 2009* (Qld).

Implementation of the *Great Barrier Reef Protection Amendment Act 2009* (Qld) has built upon the foundation of existing Australian and Queensland government programs, particularly the RWQPP and *Caring for our Country – Reef Rescue Package*; however, there is a significant opportunity to improve linkages between these programs and the Reef Protection Legislation, and to implement a comprehensive and integrated 'reef protection package' that includes a spectrum of measures from voluntary to mandatory, and related support and incentives. Linked to this is the requirement for compliance and reporting strategies that take account of, link to, and inform existing programs where appropriate. Effective monitoring and reporting will be essential in

determining the success of these regulatory measures and in further developing well-targeted regulatory measures in the future.

The measures adopted under the new *Great Barrier Reef Protection Amendment Act 2009* (Qld) are significant steps towards effective regulation of diffuse water pollution in the three high priority GBR catchments subject to the new regulatory measures. However, at this early stage, it is not possible to determine whether or not this will be enough to reverse declines in GBR water quality and to meet water quality targets. One area of concern is that the Reef Protection Legislation, in taking a risk management approach, will not necessarily address diffuse water pollution from many (sometimes small) enterprises that are collectively contributing towards diffuse water pollution entering the GBR. Although an expansion of these regulatory measures will place substantial additional cost and administrative burdens on the government, and will need to take account of a range of other factors, opportunities to introduce the regulatory measures across the entire GBR region, applying exemptions and flexibility where appropriate, should be explored.

For those watching from other jurisdictions, the effectiveness of the Reef Protection Legislation will, ultimately, be measured against its contribution towards meeting water quality targets. Case studies internationally, in Australian catchments such as the Swan-Canning, and in the GBR region have demonstrated that voluntary measures alone (even those that are well funded and supported by government and industry bodies) will not reduce or halt diffuse water pollution. What will most likely succeed are: implementing regulatory measures that seek to regulate inputs (rather than emissions), enhancing existing legislative and administrative frameworks, and complementing voluntary measures, incentives and support. It is also important to set targets against which progress is measured and allow a degree of flexibility within regulatory frameworks to enable reassessment of priority regions and industries, or other approaches, as required. The *Great Barrier Reef Protection Amendment Act 2009* (Qld) provides the Queensland Government with a specific regulatory tool that is specifically directed to and resourced for the purpose of managing diffuse source pollution. Based on international experience, it will be much more effective in halting and reducing diffuse water pollution from specified catchments and industries than reliance on voluntary measures alone.