

USING ‘THREATENING PROCESSES’ TO PROTECT FRESHWATER BIODIVERSITY FROM INVASIVE ALIEN SPECIES

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ABSTRACT

The use of formally listed ‘Key Threatening Processes’ (KTPs) is increasingly seen as a way of incorporating the regulation of invasive alien species into land and water management regimes. Yet, prior to the use of KTPs, regulators were already identifying threatening processes by classifying certain types of invasive alien species as noxious, pests, or feral and listing them on registers of prohibited species. These initiatives have been continuously supplemented by Australian jurisdictions adopting a range of strategies, frameworks and management plans relating to invasive alien species. This paper compares and contrasts the use of KTPs with other types of threatening processes as a means of dealing with invasive alien species (IAS), focusing on freshwater ecosystems. The identification and abatement of KTPs and other threatening processes occupies an important regulatory space in invasive alien species’ regimes. However, the effectiveness of these mechanisms depends as much on the success of the IAS regime as a whole as on the operation of the individual KTPs.

I INTRODUCTION

In 1817, explorer John Oxley enthusiastically described the Lachlan River in the State of New South Wales as ‘rich in the most excellent fish, procurable in the utmost abundance’.¹ Yet less than two centuries later, species located in the lowland catchment region of the Lachlan River were collectively identified as an endangered ecological community, with the introduction of

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¹ John Joseph William Molesworth Oxley, *Journals of Two Expeditions, into the Interior of New South Wales Undertaken by order of the British Government in the Years 1817-18* (1820, John Murray: London) 17 <<http://setis.library.usyd.edu.au/ozlit/pdf/p00066.pdf>>. See also discussion in Fact Sheet: Freshwater Habitats (2011) New South Wales Department of Primary Industries <<http://www.dpi.nsw.gov.au/fisheries/habitat/aquatic-habitats/freshwater>>.

alien species such as carp and plague minnow implicated in the decline.² In response to these types of threats, the New South Wales government listed the introduction of fish to fresh waters outside their natural range as a 'Key Threatening Process' (KTP).³

This type of categorisation reflects the trend in a number of Australian jurisdictions of regulating invasive alien species by identifying and listing their impacts as a formalised KTP. Yet, prior to the use of KTPs, Australian jurisdictions had already developed legislative mechanisms for regulating harmful species by declaring them noxious, pests, or feral and placing them on lists of prohibited species. In addition, Australian jurisdictions have also adopted a range of strategies, frameworks and management plans in response to growing awareness of environmental problems attributable to invasive alien species.

The purpose of this paper is to evaluate the regulation of invasive alien species by comparing and contrasting the use of KTPs with other types of threatening processes, focusing on freshwater ecosystems. These ecosystems have been selected for discussion because they are especially vulnerable to the impacts of invasive alien species and have generated a large volume of policy and administrative material. While the discussion emphasises freshwater jurisdictions, many of the comments, conclusions and recommendations can apply equally to KTPs and threatening processes of other systems. The term 'freshwater' as used in this paper refers to ecosystems located in a river or creek that are not subject to tidal influence. The references include artificially created waterways such as lakes, lagoons, dams, reservoirs, ponds, canals, channels and waterways;⁴ but do not include other aquatic ecosystems such as estuaries, coastal systems, or the marine environment. The latter have been excluded not only because they raise different regulatory issues, but also to keep the material manageable.⁵

² Fisheries Scientific Committee, *Final Recommendation, Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River* (2005)

<http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/208291/FR25-Lachlan-River-EEC.pdf>.

³ New South Wales Department of Primary Industries, *Introduction of Fish to Fresh Waters Within a River Catchment Outside their Natural Range* The State of New South Wales, (2005, Primefacts).

⁴ Taken from the *Fisheries Management Act 1994* (NSW), s 14.

⁵ For example, invasive alien species introduced by discharge of ballast water in coastal areas, engages more directly the role of the Commonwealth government and international treaties such as the International Convention for the Control and Management of Ships' Ballast Water and Sediment. Copy available by subscription from, www.imo.org, IMO Doc BWMCNF/36. The Convention was adopted under the auspices of the International

The discussion commences with a synopsis of the detrimental impacts of freshwater invasive alien species and then moves to an evaluation of the ways that Australian jurisdictions use techniques such as KTPs and other threatening processes to regulate these species. It is argued that the identification and abatement of KTPs and other threatening processes occupies an important regulatory space in invasive alien species' regimes. However, the effectiveness of these mechanisms depends as much on the success of the invasive alien species regime as a whole as on the operation of the individual KTPs.

II INVASIVE ALIEN SPECIES AND FRESHWATER ECOSYSTEMS

Alien species are species that have been introduced outside their natural past or present distribution.⁶ This definition applies to species introduced from one country to another, as well as native species translocated within the same country. Some introductions of alien species, such as those carried out for conservation purposes, have had positive outcomes. In the State of Victoria, for example, translocations of Macquarie perch and trout cod have successfully restored these species from the brink of extinction.⁷ However, many introductions of alien species are detrimental to native biodiversity.⁸ In such cases, alien species threaten ecosystems, habitats or other species and are therefore classified as 'invasive alien species' (IAS).⁹

Maritime Organization on 13 February 2004. It will come into force 12 months after ratification by 30 States, representing 35% of world merchant shipping tonnage.

⁶ Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species, footnote (57), paragraph (i). Adopted April 2003 as part of Decision VI/23 of the Conference of the Parties. Report of the Sixth Meeting of the Conference of the Parties to the Convention on Biological Diversity, UNEP/CBD/COP/6/20 (23 September 2002).

⁷ Sinclair Knight Merz, *An Overview of the Impacts of Translocated Native Fish Species in Australia* (2008, Department of the Environment, Water, Heritage and the Arts, Commonwealth of Australia) 20.

⁸ Definition of Biodiversity in accordance with Article 2 of the Convention on Biological Diversity: 'the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems'.

⁹ Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species, footnote (57), paragraph (ii).

The problem of IAS has been described by the International Union for the Conservation of Nature (IUCN) as ‘one of the major threats to biological diversity’.¹⁰ In a similar manner, the *Conference of the Parties to the Convention of Biological Diversity* (CBD) has also pinpointed the IAS dilemma as a cross-cutting issue to be dealt with in each of its thematic work programs.¹¹ In the context of freshwater systems, the CBD has specifically singled out the aquarium industry as a major source of detrimental introductions.¹² This conclusion is reinforced by the work of the IUCN that indicates world-wide almost one-third of the species listed by it as the worst invaders are garden or aquarium escapees.¹³

In Australia, fish are a significant IAS of freshwater systems. In some cases, fish have been deliberately introduced as part of stocking programs for recreational fisheries¹⁴ and also for biocontrol purposes.¹⁵ In other cases, freshwater fish have been ‘accidentally’ introduced by enthusiasts emptying aquariums and releasing unwanted pet fish.¹⁶ One recent study concluded that aquarium fish represent the greatest proportion of recent fish introductions¹⁷ with goldfish now being found in every Australian jurisdiction except the Northern Territory and Western

¹⁰ International Union for the Conservation of Nature, ‘Guidelines For the Prevention of Biodiversity Loss Caused by Alien Invasive Species’, Species Survival Commission of International Union for the Conservation of Nature, Gland, Switzerland (2000) section 1; see also See for example, Carol M. Brown, *Tilapia and the Environment*, (1995) 4(2) *TED Case Studies*, Case No. 208 <<http://www.american.edu/TED/tilapia.htm>>; E. Grossman, *Nile Perch and Lake Victoria Infestation Problem* (1995) 4(2) *TED Case Studies*, Case No. 206 <<http://www.american.edu/TED/perch.htm>>; Dianna Padilla and Susan Williams, ‘Beyond Ballast Water: Aquarium and Ornamental Trades as Sources of Invasive Species in Aquatic Ecosystems’ (2004) 2(3) *Ecological Society of America* 13.

¹¹ *Convention on Biological Diversity 1992*, adopted 5 June 1992, [1993] ATS No 32 (entered into force 29 December 1993). The convention had 193 Parties as of August 2011. The Conference of the Parties to the Convention on Biological Diversity has identified five thematic work programmes: biodiversity of marine and coastal areas; agricultural areas; forest areas; inland waters; and dry and sub-humid lands. Cross-cutting programmes pinpoint issues relevant to all thematic areas.

¹² Secretariat of the Convention on Biological Diversity, ‘Pets, Aquarium and Terrarium Species: Best Practices for Addressing Risks to Biodiversity’ (Technical Series No. 48, Montreal, SCBD, 2010).

¹³ *Ibid*, 11.

¹⁴ Sinclair Knight Merz, above n 7, 2.

¹⁵ New South Wales Department of Primary Industries, *Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River* (2006, Primefacts), 2; New South Wales National Parks and Wildlife Service, *Threat Abatement Plan, Predation by Gambusia Holbrooki – The Plague Minnow* (2003, National Parks and Wildlife Service) i <<http://www.environment.nsw.gov.au/resources/nature/ThreatAbatementPlanPlagueMinnow.pdf>>.

¹⁶ See generally, Andrew L. Chang, et al, ‘Tackling Aquatic Invasions: Risks and Opportunities for the Aquarium Fish Industry’ (2009) 11 *Biological Invasions* 773; Secretariat of the Convention on Biological Diversity, above n 12.

¹⁷ J. Corfield, B. Diggles, C. Rubb and Ors, *Review of the Impacts of Introduced Aquarium Fish Species That Have Established Wild Populations in Australia*, (2010, Commonwealth of Australia) 1.

Australia.¹⁸ Fish have also gained entry as an unintended consequence of development works. In Tasmania, for example, the construction of hydroelectricity facilities led to the flooding of Lake Pedder and the introduction of climbing galaxias, which brought the native Pedder galaxias to the point of extinction.¹⁹

If unchecked, the introduction of alien fish has the potential to develop into one of the most ecologically damaging activities undertaken by humans.²⁰ Alien fish species can impact on native fish by direct predation, competition for food and habitat, introduction of diseases²¹ and ‘loss of genetic integrity’ through hybridisation.²² Introduced fish can also impact on species such as native frogs,²³ freshwater vegetation²⁴ and contribute to changes in river bank stability.²⁵ It is telling that overall alien fish species are ‘implicated in the decline of 42% of Australian native fish and several frog species’.²⁶

Plants and amphibians are another source of alien introductions. Several species of native frogs for example are potentially under the threat of extinction from the introduced cane toad.²⁷ Moreover, almost three quarters of Australia’s freshwater weeds initiated as introduced ornamental escapees.²⁸ Plants accidentally wash into waterways from dams and ponds during flooding,²⁹ and as with fish, members of the public carelessly introduce plants when emptying aquariums.³⁰ Yet another cause of plant introductions stems from boating enthusiasts who

¹⁸ Ibid, 36.

¹⁹ This occurred in combination with the prior introduced brown trout. Merz, above n 7, 2.

²⁰ Ibid, 1.

²¹ New South Wales Department of Primary Industries, above n 15, 2; Fisheries Scientific Committee, above n 2.

²² Merz, above n 7, 13-20.

²³ Ibid, 18.

²⁴ Fisheries Scientific Committee, above n 2.

²⁵ Ibid.

²⁶ Andy Moore, Nicholas Marton and Alex McNee, *A Strategic Approach to the Management of Ornamental Fish in Australia* (2010, Bureau of Rural Sciences) iv.

²⁷ These are the green and golden bell frog, wallum froglet and the green-thighed frog. *Cane Toad – Key Threatening Process Listing* (2011) New South Wales Department of Environment and Heritage <<http://www.environment.nsw.gov.au/determinations/BufoMarinusKtp.htm>>.

²⁸ Nursery and Garden Industry Australia, *Fact Sheet: Reducing the Water Weed Risk* (2007) 6 *Nursery Papers* <http://www.ngia.com.au/files/nurserypapers/NP_2007_06.pdf>. See also Fisheries Scientific Committee, *Degradation of Native Riparian Vegetation Along New South Wales Water Courses* (2001) <http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/208377/FR19-riparian-vegetation.pdf>.

²⁹ Nursery and Garden Industry Australia, above n 28.

³⁰ The State of Queensland, Department of Environment and Resource Management, *Fact Sheet: Aquatic Weeds*, (2011).

unknowingly transport plant fragments that attach to propellers, anchors, watercraft and trailers.³¹ A more insidious dilemma stems from dishonest retailers who deliberately use public waterways to grow plants for economic advantage.³²

The effects of alien plants on freshwater ecosystems are equally as devastating as alien fish introductions. Non-native plants ‘shade out’ native vegetation and destroy habitat for native species,³³ with willow trees being a particularly sinister problem. Their root systems erode banks as well as choke rivers and streams.³⁴ What is more, in common with other deciduous trees, willows drop large volumes of leaves in a short time, which in freshwater ecosystems break down rapidly leading to a decline in water quality.³⁵

The regulation of freshwater IAS poses special challenges for regulators. To start with, the Australian continent comprises a vast land mass with an array of climatic zones and freshwater habitats. Accordingly, alien species have many opportunities to establish themselves, compared with countries whose geographical areas cover a less diverse range of habitats.³⁶ In addition, the control and eradication of freshwater weeds is a complex process. The weeds may be submerged and difficult to access;³⁷ and at the same time the technology for weed eradication and control has often been developed for terrestrial weeds and does not readily convert to freshwater environments.³⁸ In designing its IAS regimes, Australia is guided by the provisions of the CBD.

³¹ *Weed Definitions and FAQs*, NSW Government (2011) New South Wales Department of Primary Industries <<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/definition>>.

³² Nursery and Garden Industry Australia, above n 28; The State of Queensland, Department of Environment and Resource Management, above n 30.

³³ The State of Queensland, Department of Environment and Resource Management, above n 30.

³⁴ New South Wales Department of Primary Industries, above n 1.

³⁵ Linda Taman, ‘The Effects and Management of Deciduous Trees on Waterways’ (2002) *WaterNotes* WN25 <<http://www.nynrm.sa.gov.au/Portals/7/pdf/LandAndSoil/50.pdf>>.

³⁶ Corfield, Diggles, Rubb and Ors, above n 17, 16.

³⁷ Nursery and Garden Industry Australia, above n 28.

³⁸ *Ibid.*

III THE REGULATORY REGIME

A The Use of Key Threatening Processes

As already noted, the CBD has recognised the effects of IAS as a cross-cutting issue. The Convention itself obliges the parties to identify processes and activities that have, or are likely to have, a significant adverse impact on biological diversity – in other words to identify and manage threatening processes and activities.³⁹ The use of the phrase ‘likely to’ is worth mentioning because the term refers to the potential for harm, rather than simply the detection of harm once it has occurred. Accordingly, domestic regimes need to be proactive in identifying and preventing threats to biodiversity.

Article 8(h) of the CBD specifically singles out the adverse effects of IAS as a noteworthy threatening process and calls on the parties to ‘prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.’ The CBD envisages that members will employ a variety of measures to achieve these objectives, including the development of national strategies and programmes, the introduction of legislation and the strengthening of institutions.⁴⁰ The CBD does not specify how members are to structure their regimes. Therefore, members have a relatively free hand to use any combination of legal and policy instruments in order to achieve their objectives. Thus, members may: adopt formal lists of threatening processes; adapt procedures already established that deal with harmful species such as weeds, feral animals and noxious fish;⁴¹ and develop policy instruments including fisheries plans, biodiversity strategies and biosecurity strategies that provide strategic guidance for dealing with IAS.⁴²

³⁹ Convention on Biological Diversity, Article 7(c), Article 8(1).

⁴⁰ Ibid, Article 6(a), Article 8(k); Convention on Biological Diversity Guiding Principles, Guiding Principle 11.1.

⁴¹ Fisheries Management Act 1994 (NSW) s 220FC, s 220C.

⁴² For example: Natural Resource Management Ministerial Council, *Australia’s Biodiversity Conservation Strategy 2010-2030* (2010, Australian Government, Department of Sustainability, Environment, Water, Population and Communities: Canberra) 24-25; Queensland Department of Primary Industries and Fisheries, *Queensland Biosecurity Strategy 2009-14*, (2008, Queensland Government, Department of Primary Industries and Fisheries); Natural Resource Management Ministerial Council, *Australian Pest Animal Strategy – A National Strategy for the Management of Vertebrate Pest Animals in Australia* (2006, Australian Government, Department of the Environment and Water Resources: Canberra) (i); *Flora and Fauna Guarantee Act 1988* (Vic) s 3, s 10, s 11(3); *Threatened Species Conservation Act 1995* (NSW) ss 16-25A; *Land Protection (Pest and Stock Route Management)*

The concept of a threatening process is different from the totality of a country's IAS regime. The latter refers to the combination of measures, mechanisms, objectives and outcomes for dealing with IAS. It includes quarantine and biosecurity regulation, plans, strategies, legislation and other measures. The identification and abatement of threatening processes occupies one part of that regime. The CBD recognises this fact and in addition to the identification and abatement of threatening processes affirms the need for other equally important measures, such as strengthening border controls and fostering risk analysis.⁴³ Furthermore, IAS regimes also only occupy one part of broader initiatives designed to protect biodiversity. Accordingly, the CBD also recommends that members implement plans and strategies to recover threatened species and rehabilitate degraded ecosystems.⁴⁴ Indeed, listed KTPs often engage with these issues,⁴⁵ underscoring the fact that threatening processes do not operate in a regulatory vacuum. Consequently, as noted in the introduction, the effectiveness of KTPs and other threatening processes also depends on the success of the entire IAS regime.

As a preliminary matter, Australian jurisdictions recognise different calibres of threatening processes. For example, both the Commonwealth and New South Wales parliaments differentiate between 'threatening processes' and 'key threatening processes.' Section 188(3) of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) defines a threatening process as one that threatens or may threaten the survival of native species or ecological communities. Similarly, s 4 of the *Threatened Species Conservation Act 1995* (NSW) defines a threatening process as one that can threaten the survival of species or ecological communities, although the definition also extends to threats to the evolutionary development of species,

Act 2002 (Qld), ss 39-46; *Agriculture and Related Resources Protection Act 1976* (WA), s 43, s 50, s 51; *Pest Plant and Animals Act 2005* (ACT), s 9, s 18, s 22; *Plant Diseases Act 1924* (NSW); *Plant Diseases Control Act 1979* (NT); *Agriculture and Related Resources Protection Act 1976* (WA); *Catchment and Land Protection Act 1994* (Vic); *Weeds Management Act 2001* (NT); *Land Protection (Pest and Stock Route Management) Act 2002* (Qld).

⁴³ Convention on Biological Diversity Guiding Principles, Principle 7, Principle 10, Principle 11.

⁴⁴ Convention on Biological Diversity, Article 8(f).

⁴⁵ See, for example, *Final Determination Predation by the Plague Minnow (Gambusia Holbrooki) – Key Threatening Process Listing* (2011) New South Wales Department of Environment and Heritage <<http://www.environment.nsw.gov.au/determinations/PlagueMinnowKTPListing.htm>>. The plan notes, at (ii), that 'effective long-term control of gambusia across the landscape will only be achieved in partnership with programs that endeavour to restore aquatic ecosystems.' Proposed 'Action 6' detailed on pages 32-34 links the control of gambusia with habitat restoration programmes designed to recover threatened species.

populations or ecological communities. In both jurisdictions, a *key* threatening process is defined in a more restricted manner as one that has caused actual damage to threatened species or ecological communities, or adversely affects their conservation status.⁴⁶

The importance of these definitions lies in the fact that in accordance with both the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the *Threatened Species Conservation Act 1995* (NSW), only KTPs are eligible for listing.⁴⁷ This narrower formulation for the listing of KTPs has undoubtedly been designed to limit listings to those processes and activities with a significant adverse impact on biological diversity. It is also a formulation that is at least partly consistent with the definition of threatening processes found in the *Flora and Fauna Guarantee Act 1988* (Vic).

The *Flora and Fauna Guarantee Act 1988* (Vic) specifies a threatening process is eligible for listing if it poses, or has the potential to pose, a significant threat to the evolutionary development of a range of flora or fauna.⁴⁸ The primary difference between this formulation and the one found at the Commonwealth and New South Wales levels is that the Victorian legislation also stresses the potential of threatening processes to impact on biodiversity. This gives the Victorian definition a wider scope than those applying under New South Wales and Commonwealth laws. In the Australian Capital Territory, which is the only other jurisdiction to offer a legislative base for the listing of threatening processes, the *Nature Conservation Act 1980* (ACT) defines these as processes that threaten or may threaten the survival, abundance or evolution of the species or community.⁴⁹ As with the Victorian legislation, this provides a wider definitional ambit than the Commonwealth or New South Wales. However, to date no threatening processes have been listed in the Australian Capital Territory.

The common feature of these jurisdictions is that they provide for the formal listing of particular types of threatening processes, which in two of the jurisdictions are called ‘key threatening

⁴⁶ *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 188(4); *Threatened Species Conservation Act 1995* (NSW) s 13.

⁴⁷ *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 188(1); *Threatened Species Conservation Act 1995* (NSW) s 13. See also *Fisheries Management Act 1994* (NSW) s 220FC.

⁴⁸ *Flora and Fauna Guarantee Act 1988* (Vic) s 3, s 11(3).

⁴⁹ *Nature Conservation Act 1980* (ACT), definition in the Schedule to the Act.

processes'. As a consequence of this differentiation, in this paper, the term 'key threatening process' (KTP) is used to denote threatening processes that can be formally listed under Commonwealth, New South Wales, Victorian and Australian Capital Territory legislation. The term 'threatening process' is used to describe other means of identifying the deleterious impacts of IAS, such as the development of lists of prohibited species and the myriad references to IAS in strategies and management plans.

B Key Threatening Processes and Invasive Alien Species in Biodiversity Legislation

As just noted, statutes that facilitate the listing of KTPs include: the *Environment Protection and Biodiversity Conservation Act 1999* (Cth);⁵⁰ the *Threatened Species Conservation Act 1995* (NSW);⁵¹ the *Flora and Fauna Guarantee Act 1988* (Vic);⁵² and the *Nature Conservation Act 1980* (ACT).⁵³ In addition, NSW affords separate listing procedures for KTPs of terrestrial and freshwater systems. IAS that impact on terrestrial systems are regulated under the *Threatened Species Conservation Act 1995* (NSW),⁵⁴ while IAS that impact on freshwater systems are dealt with under the *Fisheries Management Act 1994* (NSW).⁵⁵ The two statutes contain mirror provisions for listing of KTPs and abating their threats.⁵⁶

The procedures for nominating and listing KTPs are roughly equivalent. The process commences by a nomination that may be made by any person, including members of the public.⁵⁷ Once the

⁵⁰ *Environment Protection and Biodiversity Conservation Act 1999* (ACT), s 183, s 188, s 528.

⁵¹ *Threatened Species Conservation Act 1995* (NSW) s 8, s 17, s 128A, s 74-85.

⁵² *Flora and Fauna Guarantee Act 1988* (Vic) s 10(2), s 11(3), Schedule 1 s 5.1.

⁵³ *Nature Conservation Act 1980* (ACT) s 38(1).

⁵⁴ *Threatened Species Conservation Act 1995* (NSW), s 5A.

⁵⁵ *Fisheries Management Act 1994* (NSW) s 220FC, s 220FD.

⁵⁶ *Threatened Species Conservation Act 1995* (NSW), ss 16-25A; *Fisheries Management Act 1994* (NSW), s 220C(6) (listing process); *Threatened Species Conservation Act 1995* (NSW), ss 17, 23; *Fisheries Management Act 1994* (NSW) ss 220G, 220L (role of scientific committees).

⁵⁷ *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 194E; *Threatened Species Conservation Act 1995* (NSW) s 18; *Fisheries Management Act 1994* (NSW) s 220H; *Flora and Fauna Guarantee Act 1988* (Vic) s 12; *Nature Conservation Act 1980* (ACT) s 39. In addition, although Tasmania does not provide for the listing of KTPs, it does permit the public to nominate threatening processes. See *Threatened Species Protection Act 1995* (Tas) s 16.

nomination is made, it is evaluated by a scientific committee.⁵⁸ For the most part, the committee provides advice on whether to accept a nomination by making recommendations to the relevant Minister.⁵⁹ Less commonly, the committee makes the decision whether to accept or reject a nomination.⁶⁰ If a nomination is accepted it is placed on a list of KTPs awaiting further action. Such action can include the preparation and implementation of a threat abatement plan and the linking of abatement measures with the recovery of threatened species and ecosystems.⁶¹

Table 1 contains a listing of KTPs of freshwater systems attributable to IAS. From this summary, two KTPs stand out – the degradation of riparian systems by introduced plants and the impact of introduced fish on freshwater biodiversity. Given that the purpose of listing KTPs is to identify and abate environmental threats, it would be reasonable to assume that the preparation and implementation of abatement and recovery strategies would automatically follow these listings of KTPs. Yet this is not necessarily the case.

⁵⁸ These committees are established by legislation: *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 502; *Threatened Species Conservation Act 1995* (NSW) s 128; *Fisheries Management Act 1994* (NSW) ss 221ZA-221ZE; *Flora and Fauna Guarantee Act 1988* (Vic) s 8(3); *Nature Conservation Act 1980* (ACT) s 13, s 14 establish the Flora and Fauna Committee.

⁵⁹ *Environment Protection and Biodiversity Conservation Act 1999* (Cth), s 189, s 503; *Flora and Fauna Guarantee Act 1988* (Vic) s 8(2), s 16; *Nature Conservation Act 1980* (ACT) s 13, s 14, s 38(3).

⁶⁰ *Threatened Species Conservation Act 1995* (NSW), s17, s 23; *Fisheries Management Act 1994* (NSW) s 220G.

⁶¹ *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ss 267-284; *Threatened Species Conservation Act 1995* (NSW) ss 74-85; *Fisheries Management Act 1994* (NSW) ss 220ZJ-220ZP; *Flora and Fauna Guarantee Act 1988* (Vic) s 21(1); *Nature Conservation Act 1980* (ACT) s 40. With respect to the linking of threat abatement plans to recovery of threatened species and ecosystems see above n 45.

Table 1: Invasive Alien Species Listed as Key Threatening Processes of Freshwater Systems

Jurisdiction	(Key) Threatening Process
Federal	<p>KTPs Accepted for Listing under <i>Environment Protection and Biodiversity Conservation Act 1999</i> (published in the Gazette)</p> <ul style="list-style-type: none"> • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants. • Infection of amphibians with chytrid fungus resulting in chytridiomycosis.
New South Wales	<p>KTPs Accepted for Listing under <i>Threatened Species Conservation Act 1995</i> (Schedule 3)</p> <ul style="list-style-type: none"> • Infection of frogs by amphibian chytrid causing the disease chytridiomycosis (22 August 2003). • Invasion and establishment of the cane toad (<i>Bufo marinus</i>) (21 April 2006) • Predation by <i>Gambusia Holbrooki</i> Girard, 1859 (plague minnow or mosquito fish) (29 January 1999). <p>KTPs Accepted for Listing under <i>Fisheries Management Act 1994</i> (Schedule 6)</p> <ul style="list-style-type: none"> • The introduction of fish to fresh waters within a river catchment outside their natural range. • The degradation of native riparian vegetation along New Wales water courses. • (Other KTPs relevant to aquatic systems include the introduction of non-indigenous fish and marine vegetation to the coastal waters of New South Wales).
Victoria	<p><i>Flora and Fauna Guarantee Act 1988</i> (Schedule 3)</p> <ul style="list-style-type: none"> • Degradation of native riparian vegetation along Victorian rivers and streams. • Introduction of live fish into waters outside their natural range within a Victorian river catchment after 1770. • (Other KTPs relevant to aquatic systems include: the input of organotins to Victorian marine and estuarine waters; the introduction and spread of <i>Spartina</i> to Victorian estuarine environments; and the introduction of exotic organisms into Victorian marine waters).
Australian Capital Territory	<ul style="list-style-type: none"> • No threatening processes yet declared.

To start with, Australian legislation with respect to KTPs is often permissive, rather than obligatory. Consequently, the Minister normally retains wide discretion in determining whether to prepare and implement threat abatement plans. In New South Wales, for example, regulators

‘may’ prepare a threat abatement plan which the Minister needs to approve.⁶² In coming to a determination, the Minister must have regard to the likely social and economic consequences of the plan and can refuse consent because of those considerations.⁶³ Accordingly, in exercising his or her discretion, the Minister cannot automatically allow environmental concerns to override other criteria, yet social and economic considerations may override environmental concerns.

In Victoria, the provisions of the *Flora and Fauna Guarantee Act 1988* (Vic) are similarly permissive;⁶⁴ although in determining the list of KTPs the Minister may only have regard to conservation matters.⁶⁵ It is also worth pointing out that in Queensland the Minister ‘may’ issue interim conservation orders for threatening process.⁶⁶ Although this power is permissive, it is nevertheless important, because the *Nature Conservation Act 1992* (Qld) does not otherwise deal with KTPs in a formalised manner.⁶⁷ To date, the power has not been used with respect to IAS, but has been used to impose a 60 day ban on net fishing in the Boyne River region to protect turtles.⁶⁸

Even where legislation uses words of obligation such as ‘must’ or ‘shall’ this does not necessarily diminish the Minister’s discretion. At the Commonwealth level, s 270A of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) stipulates that the Minister ‘must’ prepare a threat abatement plan, but only if he or she believes that the plan is a feasible, effective and efficient way to abate the process. By way of illustration, on 8 January 2010 the Minister accepted that ‘Loss and Degradation of Native Plant and Animal Habitat by

⁶² *Threatened Species Conservation Act 1995* (NSW) s 74 the Director-General may prepare a threat abatement plan; *Fisheries Management Act 1994* (NSW) s220ZJ the Director-General may prepare a threat abatement plan. The preparation of a threat abatement plan was in fact mandatory in New South Wales up until 2004 when the *Threatened Species Legislation Amendment Act 2004* (NSW) amended the word ‘must’ to read that the Minister ‘may’ prepare a threat abatement plan. This change was partly prompted by the backlog of KTPs awaiting preparation of plans. See further discussion on this point in Part V of this paper.

⁶³ *Threatened Species Conservation Act 1995* (NSW) s 83; *Fisheries Management Act 1994* (NSW) s 220ZP.

⁶⁴ *Flora and Fauna Guarantee Act 1988* (Vic) s 21(1). Threat abatement plans are referred to as management plans.

⁶⁵ *Flora and Fauna Guarantee Act 1988* (Vic) s 10(7).

⁶⁶ *Nature Conservation Act 1992* (Qld), s 102.

⁶⁷ Section 82 of the *Nature Conservation Act 1992* (Qld) permits regulators to declare wildlife as ‘prohibited’ if it constitutes a threat to native wildlife. However, as discussed in Part 3, Sub-section C of this paper, this type of declaration differs from the listing process of KTPs.

⁶⁸ The Honourable Kate Jones, Minister for Environment and Resource Management ‘Fishing Industry and Government Act To Protect Turtles in the Boyne River’ (Media Release, 2 May 2011) <<http://www.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=74570>>.

Invasion of Escaped Garden Plants, Including Aquatic Plants' should be listed as a KTP.⁶⁹ However, the Minister also decided that a threat abatement plan was not a feasible, effective or efficient way to abate the process. In doing this, the Minister followed advice given by the Threatened Species Scientific Committee that existing institutions established under the auspices of the *Australian Weeds Strategy 2007* were sufficient to deal with escaped garden plants. Yet, gaps and inconsistencies with weed regulation in Australia are notorious and have already been well documented in the literature.⁷⁰

Unlike the provisions of Commonwealth legislation, s 40 of the *Nature Conservation Act 1980* (ACT) provides that the conservator⁷¹ 'shall' prepare a draft action plan to minimise threatening processes. Yet, this provision still needs to be read in conjunction with s 38(3) of the same Act, which initially gives the Minister a wide discretion whether to declare a threatening process.⁷² It is telling that, as already noted, at the time of writing no threatening processes have been declared, despite the fact that the *1997 Nature Conservation Strategy* pointed out that the Australian Capital Territory still had much work to do with respect to species such as willow that were steadily invading riparian ecosystems.⁷³ Ten years later, in 2007, willows were still identified as a significant problem in the Australian Capital Territory.⁷⁴

⁶⁹ Advice to the Minister for the Environment, Heritage and the Arts from the Threatened Species Scientific Committee (the Committee) on Amendments to the List of Key Threatening Processes under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) <<http://www.environment.gov.au/biodiversity/threatened/ktp/pubs/garden-plants-listing-advice.pdf>>.

⁷⁰ Richard Groves, Robert Boden and Mark Lonsdale, *Jumping the Garden Fence Invasive Plants in Australia and their Environmental and Agricultural Impacts* (2005); Paul Martin, Robyn Bartel, Jack Sinden, Neil Gunningham and Ian Hannam, *Developing a Good Regulatory Practice Model for Environmental Regulations Impacting on Farmers – Overview* (2007, Australian Farm Institute: Surry Hills Australia) 2; Jack Sinden, et al, 'The Economic Impact of Weeds in Australia' (Technical Series No. 8, CRC for Australian Weed Management, March 2004) 5; Mark Burgman, Terry Walshe, Lee Godden and Paul Martin, 'Designing Regulation for Conservation and Biosecurity' (2009) 13(1) *Australasian Journal of Natural Resources Law and Policy* 93, 110.

⁷¹ The conservator is appointed under s 7 of the *Nature Conservation Act 1980* (ACT) for the purposes of carrying out functions under the Act.

⁷² *Nature Conservation Act 1980* (ACT), s 38(3). The Flora and Fauna Committee makes a recommendation to the Minister with respect to declaration of a threatening process, which the Minister may accept.

⁷³ ACT Government, Territory and Municipal Services, above n 83, Part 3.1.

⁷⁴ Hugo Bowman, and Vanessa Keyzer, *Molonglo River Rescue Action Plan 2010*, (2010, ACT Government, Natural Resource Management Council) 4, 9, 11, 20, 24. This situation in fact prompted local communities to embark on a restoration program in Yarralumla Creek. See Australian Government Department of the Environment, Water, Heritage and the Arts, *Willows, National Management Guide, Weeds of National Significance, Victorian Department of Primary Industries* (2007) 98.

A further difficulty with formalised KTPs is the fact that not all jurisdictions in Australia use them. As indicated in Table 1, only four of the nine jurisdictions provide for the listing of KTPs. Accordingly, more than half of Australia's State and Territory governments, namely, Western Australia, Northern Territory, South Australia, Tasmania and Queensland, do not accommodate official lists of KTPs.⁷⁵ That fact, however, does not also mean that more than half of Australia's jurisdictions are inactive with respect to IAS. Indeed, as already mentioned, regulators can identify and regulate IAS as a threatening process in a variety of ways including the declaration of lists of prohibited species.

C Threatening Processes and Prohibited Species

All Australian jurisdictions have enacted legislation that enables regulators to declare pest species of plants or fish as noxious,⁷⁶ weed, or feral. This type of declaration essentially creates lists of prohibited species (or prohibited lists) and is often a precursor to offences created for the sale or possession of declared species.⁷⁷ Section 78 of the *Fisheries Management Act 2007* (SA), for example, prohibits a person from being in possession or control of noxious fish or bringing such fish into South Australia without a permit. In a similar manner, ss 104 and 105 of the *Fish Resources Management Act 1994* (WA) also prohibit individuals from keeping noxious fish or bringing them into the state. Legislation can also proscribe the release of live fish,⁷⁸ or the import, possession and release of non-native fish.⁷⁹ Comparable provisions apply to lists of prohibited plant species. In New South Wales, in accordance with the *Noxious Weeds Act 1993* (NSW), the Minister for Primary Industries may declare plants as noxious.⁸⁰ Pursuant to this power, the Minister has declared as noxious a number of notable IAS of freshwater systems,

⁷⁵ Tasmania and Queensland however do refer to, and define threatening processes, see *Threatened Species Protection Act 1995* (Tas), s 3; *Nature Conservation Act 1992* (Qld), s 12.

⁷⁶ For example, Schedule 6C of the *Fisheries Management Act 1994* (NSW) sets out a list of declared noxious fish and vegetation in New South Wales. At the time of writing, the list contained one declared plant and 137 declared fish; *Fisheries Act 2000* (ACT), s 14; *Natural Resources Management Act 2004* (SA) Chapter 8.

⁷⁷ *Fisheries Management Act 1994* (NSW) s 210, s 211; *Fisheries Act 1994* (Qld), s 78, s 89, s 92; *Fisheries Act* (NT) s 15(1)(b); *Fisheries Management Act 2007* (SA) s 78; *Fisheries Act 2000* (ACT), s 78; *Fish Resources Management Act 1994* (WA) s 104, s 105.

⁷⁸ *Fisheries Act* (NT) s 15(1)(a).

⁷⁹ *Fisheries Act 2000* (ACT) s 76; *Fisheries Act 1994* (Qld) s 90; *Fisheries Management Act 1994* (NSW) s 216(1); See also, in Tasmania, the *Living Marine Resources Management Act 1995* (Tas) s127, s 128, s 129.

⁸⁰ *Noxious Weeds Act 1993* (NSW) s 7, s 33.

including Alligator weed, Salvinia and Water Lettuce.⁸¹ The Minister also has concomitant powers under the *Fisheries Management Act 1994* (NSW) and has listed *Caluperia* in Schedule 6C of the Act as an aquatic weed.

The declaration of pest species and the creation of prohibited lists underpin policy aimed at regulating species already identified as causing damage. For this reason, prohibited lists do not deal with the *potential* of species to become an IAS in the preventative manner emphasised by the CBD. By way of contrast, a number of policy instruments and management plans relevant to freshwater systems do consider this point. These initiatives, however, vary considerably in their design, and the extent to which they engage with IAS.

D Invasive Alien Species as a Threatening Process in Strategies and Management Plans

The types of instruments adopted by Australian jurisdictions that relate to IAS include policy initiatives covering biosecurity, biodiversity, threatened species and invasive species.⁸² These instruments are designed to provide strategic guidance for the problem of IAS. For example, the deleterious impacts of freshwater IAS are noted in six out of the seven biodiversity strategies adopted at the Federal, State and Territory levels in Australia.⁸³ The strategies note the

⁸¹ Department of Primary Industries, above n 31.

⁸² See for example, The Intergovernmental Agreement on Biosecurity: An Agreement Between The Commonwealth of Australia, State and Territory Governments To Strengthen The National Biosecurity System <http://www.coag.gov.au/intergov_agreements/docs/intergovernmental_agreement_biosecurity.pdf>; Department of Environment and Resource Management, Building Nature's Resilience – A Draft Biodiversity Strategy for Queensland, State of Queensland 2010; Tasmanian Department of Primary Industries, Water and Environment - Nature Conservation Branch, Threatened Species Strategy 2000 <[http://www.dpiw.tas.gov.au/inter.nsf/Attachments/RLIG-542642/\\$FILE/threatspstrat.pdf](http://www.dpiw.tas.gov.au/inter.nsf/Attachments/RLIG-542642/$FILE/threatspstrat.pdf)>.

⁸³ State of New South Wales, Industry and Investment NSW and the Department of Environment, Climate Change and Water, *Draft NSW Biodiversity Strategy 2010-2015* (2010) NSW Government DECCW, 87-8, <<http://www.environment.nsw.gov.au/resources/biodiversity/strategy/10821DraftBioStrat.pdf>>; Department of Environment and Resource Management, above n 82, 8; Victorian Department of Sustainability and Environment, *Victoria's Biodiversity Strategy 2010-2015 Consultation Draft, the State of Victoria, Department of Sustainability and Environment* (2010), 19-20; Tasmanian Government, *Tasmania's Nature Conservation Strategy 2002-2006*, 36 <[http://www.dpiw.tas.gov.au/inter.nsf/Attachments/JCOK-5L2664/\\$FILE/NCS%20Final%20Report%202003.pdf](http://www.dpiw.tas.gov.au/inter.nsf/Attachments/JCOK-5L2664/$FILE/NCS%20Final%20Report%202003.pdf)>; Australian Capital Territory Government, Territory and Municipal Services, *The ACT Nature Conservation Strategy* (1997), Part 3.1 <http://www.tams.act.gov.au/__data/assets/pdf_file/0020/13493/natureconservationstrategyword.pdf>; Natural Resource Management Ministerial Council, above n 42, 61; State of Victoria, Department of Primary Industries, *Invasive Plants and Animals, Framework* (2010).

desirability of collaborative efforts⁸⁴ and increasingly emphasise the need to identify and regulate pathways of invasion. Typical of this trend is the *Tasmanian Nature Conservation Strategy 2002-2006* that stresses the need to manage ‘sites and avenues of high-risk new introductions.’⁸⁵

Additionally, the impacts of freshwater IAS feature in numerous instruments that deal with recreational fisheries, ornamental fish and aquatic weeds.⁸⁶ The Commonwealth Government, in particular, has adopted a number of national policies and strategies aimed at providing leadership for the States and Territories to develop their own instruments. Commonwealth initiatives include the *National Policy for the Translocation of Live Aquatic Organisms – Issues, Principles and Guidelines for Implementation (National Translocation Policy)*⁸⁷ and the *National Code of Practice for Recreational and Sport Fishing (RecFish Australia 2001) (Recreational Fishing Code)*.⁸⁸ These documents are designed to reduce the likelihood of translocating species that can become invasive or introduce pests and diseases. Hence, key recommendations include not using high risk alien species as live bait and following uniform guidelines for stocking in private waters to ensure that locally-native fish are used.⁸⁹ The States and Territories have in fact used these instruments to formulate their own frameworks for translocation of aquatic species.⁹⁰

These developments, in a very practical sense, identify the introduction of alien fish as a threatening process and provide guidance for dealing with that process. The instruments, however, neither deal with alien fish already present in a jurisdiction, nor act as recovery or

⁸⁴ State of New South Wales, Industry and Investment NSW and the Department of Environment, above n 83, 88.

⁸⁵ Tasmanian Government, *Tasmania’s Nature Conservation Strategy 2002-2006*, above n 83, 38.

⁸⁶ For example, Queensland Government, Department of Primary Industries, Management Arrangements for Translocation of Live Aquatic Organisms (Transport Between Bioregions) for Aquaculture, Aquaculture Policy FAMOP015 (2006) <http://www.dpi.qld.gov.au/documents/Fisheries_Aquaculture/Translocation-Policy.pdf>; Ministerial Council on Forestry Fisheries and Aquaculture, *National Policy for the Translocation of Live Aquatic Organisms – Issues, Principles and Guidelines for Implementation*, Bureau of Rural Sciences (1999) <http://adl.brs.gov.au/brsShop/data/12105_translocation.pdf>; Moore, Marton and McNee, above n 26; Management Arrangements for Translocation of Live Aquatic Organisms (Transport Between Bioregions) for Aquaculture, above n 86; Phil Moran, Noosa and District Landcare Group, *Mary River Aquatic Weed Strategy, 2010-2014* (2009) Queensland Government <http://www.bmrg.org.au/downloads/Mary_River_Aquatic_Weed_Management_Strategy.pdf>.

⁸⁷ Ministerial Council on Forestry Fisheries and Aquaculture, above n 86.

⁸⁸ *National Code of Practice for Recreational and Sport Fishing (RecFish Australia 2001)* (2001) Department of Agriculture Fisheries and Forestry <http://www.daff.gov.au/_data/assets/pdf_file/0019/6058/nat_code_of_practice_2001.pdf>.

⁸⁹ Ministerial Council on Forestry Fisheries and Aquaculture, above n 86, 14-15; *National Code of Practice for Recreational and Sport Fishing*, above n 88, paragraph 3; Merz, above n 7, 41.

⁹⁰ See discussion in Merz, above n 7, Parts 7.1, Part 7.2, 43-46.

rehabilitation plans for threatened species and degraded ecosystems. This is hardly surprising since both the *National Translocation Policy* and the *Recreational Fishing Code* were largely developed to stop unwarranted introductions of aquatic species in the context of recreational fishing. Indeed, as the *Fish Stocking Plan for the Australian Capital Territory 2009-2014* notes, fish stocking plans rarely consider that the very act of restocking may put threatened species under further stress.⁹¹ For this reason, these types of instruments do not provide a comprehensive regulatory channel between the threatening process they address and the recovery and rehabilitation of threatened species and degraded ecosystems.

Elsewhere, plans and strategies represent a potpourri of regulation. Some consider a limited range of abatement measures such as eradication and control of alien species, while others reach further to consider recovery of threatened species and rehabilitation of degraded ecosystems.

For example, the *Action Plan for South Australian Freshwater Fishes 2007-2012* notes the importance of developing measures to reduce the numbers of alien fish introduced into South Australia. Additionally, the plan outlines the advantages of carrying out targeted control measures in order to ‘improve resilience of native fish populations’.⁹² The plan therefore recognises the need to abate the threats posed by alien fish. However, in similarity with the *National Translocation Policy* and the *Recreational Fishing Code*, the *South Australian Action Plan* does not grapple with recovery of threatened species and rehabilitation of degraded ecosystems. Similar comments can be made about other strategies, such as the *Mary River Aquatic Weed Strategy 2010-2014*.⁹³ This initiative deals with early detection, eradication and containment of aquatic weeds, but is not intended to operate as a recovery or rehabilitation plan beyond recommending measures for abating the threatening processes it identifies.

⁹¹ The Department of Environment, Climate Change, Energy and Water, *Fish Stocking Plan for the Australian Capital Territory 2009-2014* (2009) 7
<http://www.environment.act.gov.au/__data/assets/pdf_file/0004/156820/Fish_stockplan_2009-2014_final.pdf>.

⁹² Michael Hammer, Scott Wedderburn and Jason van Weenen, *Action Plan for South Australian Freshwater Fishes*, (2009, Department for Environment and Heritage, Native Fish Australia (SA) Inc Adelaide) 5, 138-146.

⁹³ Phil Moran, above n 86.

In contrast, plans dedicated to recovery of threatened species by their very nature will consider recovery *and* rehabilitation issues. The *Mary River Cod Research and Recovery Plan*,⁹⁴ for example, concentrates on restoring cod populations in their historic range within the Mary River system and also on rehabilitating cod habitat. One of the objectives of the plan is to reduce the impacts of alien species on the Mary River Cod. Consequently, the plan recommends a range of measures including: disallowing further introductions of non-native fish;⁹⁵ investigating the feasibility of establishing fish hatcheries along the Mary River; and rehabilitating fish habitat.⁹⁶

The examples of KTPs and other threatening processes discussed in this part of the paper are but a selection taken from a voluminous amount of law and policy that authorities have developed for dealing with IAS of freshwater systems.⁹⁷ Each of the legislative initiatives, strategies, plans and policy documents is vital to the IAS regime. Yet the effectiveness of these measures not only depends on their individual utility, but also on how they function as a whole – for gaps and inconsistencies in either area can weaken the entire IAS regime.

IV GAPS AND INCONSISTENCIES

Gaps and inconsistencies attributable to the use of KTPs and other threatening processes stem from at least two sources: first, weaknesses with the operation of the processes themselves; and second, deficiencies with the IAS regime that impede the operation of KTPs and threatening processes. The Secretariat of the CBD has succinctly weighed up Australia's problems with respect to freshwater systems:

Ornamental fish are a significant threat to freshwater ecosystems in Australia ... Each jurisdiction has different regulations and management regimes for the ornamental fish trade. It is uncertain what species are being traded in Australia and in what abundance.⁹⁸

⁹⁴ Robert Simpson and Peter Jackson, *The Mary River Cod Research and Recovery Plan* Queensland Department of Primary Industries – Fisheries Group, Prepared for Endangered Species Program, Environment Australia, Project Number ESP 505 (undated) <<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/mary-river-cod/pubs/mary-river-cod.pdf>>.

⁹⁵ *Ibid*, 22.

⁹⁶ *Ibid*, 26-29, 33-34.

⁹⁷ For discussion of some of these initiatives see generally Merz, above n 7.

⁹⁸ Secretariat of the Convention on Biological Diversity, above n 12, 11.

This pointed critique highlights a crucial problem stemming from inconsistencies in regulation amongst Australia's jurisdictions. Yet, notwithstanding this critique the jurisdictions share a number of seemingly common characteristics, such as the establishment of lists of prohibited species, and the use of plans and strategies that seek to grapple with the deleterious impacts of freshwater IAS.

The use of prohibited lists can provide a degree of certainty for stakeholders and managers and are useful in identifying and dealing with the most pressing IAS.⁹⁹ The lists are also supported by a range of sanctions and penalties designed to enhance their operation further. However, the lists do not necessarily translate well from paper to implementation.

To start with, the content of the lists varies across Australia. The jurisdictions each incorporate different species in their lists, meaning that a species prohibited in one jurisdiction may be permitted in an adjacent one.¹⁰⁰ This jeopardises the capacity of regulators to implement risk management measures to control cross-border movements in declared species.¹⁰¹ Accordingly, in a practical sense, the lists are ineffective to block the internal trade in declared species. At present, the public trades in approximately two thousand species of ornamental fish and many of these are non-native.¹⁰² Thirty of these species are now established in freshwater ecosystems and cause significant harm.¹⁰³

The reasons for the continuing trade in harmful species are only partly attributable to deficiencies in the prohibited lists prepared by the states and territories. Other reasons stem from weaknesses in Australia's border controls in quarantine and biosecurity. Initially, then, harmful species are thought to gain entry from undetected smuggling activities.¹⁰⁴ Enforcement officers can face exceptional difficulties identifying some fish and plant species, particularly those destined for the

⁹⁹ Natural Resource Management Ministerial Council, *A Strategic Approach to the Management of Ornamental Fish in Australia*, Department of Agriculture, Fisheries and Forestry (2006), 8
<http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/288425/Management-of-ornamental-fish-in-Australia.pdf>.

¹⁰⁰ *Ibid*, 3.

¹⁰¹ *Ibid*, 8.

¹⁰² Moore, Marton and McNee, above n 26, iv.

¹⁰³ *Ibid*.

¹⁰⁴ Natural Resource Management Ministerial Council, above n 99, 8.

aquarium trade.¹⁰⁵ Fish, for example, are notoriously difficult to identify in their juvenile phase and smugglers who are aware of this fact have been caught mixing juvenile forms of prohibited fish with permitted species.¹⁰⁶ A second reason derives from defective policy that permits harmful fish species to gain entry. At the time of writing, for example, Commonwealth regulation still permits 10 of the 30 harmful species just referred to, to be imported.¹⁰⁷ This signifies a need to re-evaluate import procedures at the Commonwealth level. Prior to 2007, a similar loophole existed with respect to invasive plants until Biosecurity Australia reviewed its import procedures.¹⁰⁸

The third reason for the continuing trade in harmful species flows from the fact that border controls do not deal with species already present in a jurisdiction. Prior to 1998 the *Quarantine Act 1908* (Cth) allowed the importation of numerous animals, plants and their products into Australia, unless there was ‘compelling scientific evidence’ to indicate that these commodities posed a threat.¹⁰⁹ *Quarantine Proclamation 1998* (Cth) reversed this position by prohibiting the entry of animals, plants and their products unless they were already on a permitted list, or they were assessed and a permit granted for their importation.¹¹⁰ The proclamation however, did not deal with species that had already been imported into Australia. It is highly likely, for example, that many fish species being traded within Australia and not currently on the national permitted list were introduced prior to these amendments.¹¹¹

These three points reinforce the importance of Australia’s border controls in quarantine and biosecurity and their repercussions for state and territory regulation. While the internal regulation

¹⁰⁵ Ibid, 14.

¹⁰⁶ Ibid, 9.

¹⁰⁷ Moore, Marton and McNee, above n 26, iv.

¹⁰⁸ For discussion of the problem see Andreas Glanzig, *Closing Australia’s Quarantine Loophole to New Weeds* (2005, WWF-Australia: Sydney), 8-9.

¹⁰⁹ Samantha Gray, ‘Aquatic Imports in Australia: Quarantine, International Trade and Environmental Protection’ (2000) 17 *Environmental and Planning Law Journal* 241, 242.

¹¹⁰ Essentially, only plant seeds listed in Schedule 5 of Quarantine Proclamation are permitted entry. All other importation of plant and animal products must undergo a risk assessment. The proclamations are available from <<http://legislation.gov.au/comlaw/comlaw.nsf/sh/homepage?OpenDocument>>. The 1998 Proclamation is available from: *Quarantine Proclamation 1998* (2011) Australian Government: ComLaw <<http://www.comlaw.gov.au/comlaw/legislation/legislativeinstrumentcompilation1.nsf/current/bytitle/AE38C4F883931ACECA256FC60003F7DB?OpenDocument&mostrecent=1>>.

¹¹¹ Natural Resource Management Ministerial Council, above n 99, 8.

of species that threaten biodiversity is often left to State and Territory jurisdictions, the success of this regulation is also dependant on the effectiveness of Commonwealth procedures.

Compounding these problems are further dilemmas stemming from the relationship between threatening processes and KTPs in the context of the IAS regime. As more species are added to prohibited lists, governments will find it increasingly difficult to enforce regulation and fund eradication and control measures.¹¹² This problem is exacerbated in those jurisdictions that lack a cohesive structure for dealing with KTPs – for these will also be the very jurisdictions that consign threatening processes to other regulatory pathways, such as prohibited lists. Yet, in doing so, regulators are adding further stress to already over-burdened systems without necessarily addressing the cause of the IAS problem. What is more, prohibited lists are normally administered under the control of agricultural or primary industries product sectors, rather than agencies charged with protecting biodiversity.¹¹³ The danger in these cases lies in the tendency of the regimes to develop an emphasis on pests of agriculture and primary production. Arguably, the listing of KTPs provides a counter-balance, because KTPs focus on the protection of biodiversity and squarely place IAS on the environmental agenda. It will be recalled that by their very nature KTPs are designed to identify threats to biodiversity. The definitions and descriptions of KTPs, for example, are based on the impact of the processes on threatened species and ecological communities. In addition, the listing of KTPs can identify a variety of threats to biodiversity including threats created by pathways of invasion.

Prohibited lists on the other hand are a form of command and control regulation that concentrate on a restricted range of individual species known to be causing damage. This not only runs the risk of narrowing the focus of the regime,¹¹⁴ but also highlights a weakness in the capacity of the regime to identify potential IAS. Although one of the criticisms of KTPs is that they largely identify threatening processes after damage has occurred, the ability of KTPs to identify pathways of invasion presents opportunities to identify processes with the *potential* to introduce

¹¹² State of Victoria, Department of Primary Industries, above n 83, 3.

¹¹³ S. T. Garnett, G. Ainsworth and R. Carey, *Analysis of Northern Territory legislation for the Protection of Threatened Species* (2007), 22.

¹¹⁴ Parliament of Tasmania, *Auditor-General Special Report No. 78, Management of Threatened Species* (2009) Parliament of Tasmania, 18

<<http://www.audit.tas.gov.au/publications/reports/specialreport/pdfs/specialreport78.pdf>>.

IAS. Moreover, as pathways of invasion are often responsible for the entry of more than one species, regulating pathways presents an opportunity to target measures that simultaneously prevent the entry and establishment of several IAS.¹¹⁵

Command and control regulation is also weak in engaging stakeholders in a meaningful way. In common with other types of alien species, freshwater IAS are often introduced to fulfil human needs or desires.¹¹⁶ Hence the introduction of mosquito fish was a failed attempt at biocontrol, rainbow and brown trout were deliberately introduced for recreational fishing; and species, such as goldfish and aquarium plants are purchased by enthusiasts who carelessly release them into waterways.¹¹⁷ Although legislation can establish systems for licensing, help create lists of prohibited species and impose a range of penalties and sanctions, it is questionable whether these initiatives are sufficiently responsive to address underlying patterns of behaviour. To deal with this human aspect of the IAS problem regulators need to reconceptualise accepted practices and re-shape behaviour. As a starting point, regulators need to engage more effectively with the public and stakeholders.

The formal identification of KTPs, provides one means of engaging with the community because the public is able to contribute by nominating KTPs for listing.¹¹⁸ Where individuals are able to participate, a significant number of proposals for listing are in fact generated by the public.¹¹⁹ In a similar way, the development of strategies and management plans that identify threatening processes, and call on the public for comments and submissions, can also engage stakeholders and the community. This is not to say that established procedures for public participation are

¹¹⁵ State of Victoria, above n 8, 3; Paul O. Downey, Moira C. Williams, Leonie K. Whiffen and Ors, 'Weeds and Biodiversity Conservation: A Review of Managing Weeds Under the New South Wales Threatened Species Conservation Act 1995' (2009) 10 (S1) *Ecological Management and Restoration* S53, S56.

¹¹⁶ See generally, Jeffrey McNeely, 'An Introduction to Human Dimensions of Invasive Alien Species', in Jeffrey A McNeely (ed), *The Great Reshuffling, Human Dimension of Invasive Alien Species Help Feed the Global Economy* (2001).

¹¹⁷ See for example, Department of Primary Industries, above n 15, 2; NSW Scientific Committee, above n 45.

¹¹⁸ Environment Protection and Biodiversity Conservation Act 1999 (Cth), s 194E; Threatened Species Conservation Act 1995 (NSW), s 18; Fisheries Management Act 1994 (NSW), s 220H; Flora and Fauna Guarantee Act 1988 (Vic), s 12; Nature Conservation Act 1980 (ACT), s 39.

¹¹⁹ Bob Makinson, 'A Directory of Conservation-Status Listing Processes for Threatened Australian Plant Species and Ecological Communities' (2008) 17(2) *Australasian Plant Conservation* 2, 4. An exception to this is the Australian Capital Territory where no threatening processes have been declared in accordance with the *Nature Conservation Act 1980* (ACT).

above criticism. Indeed, a joint submission by WWF Australia, The Australian Council of National Trusts and the Tasmanian Conservation Trust on the operation of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) highlighted important deficiencies in the public participation mechanisms of that Act. More specifically, the criticisms centred on the lack of weight given to submissions made by the public, the costs to members of the public in appealing decisions, and the short time frame available for making comments.¹²⁰

In the context of KTPs, another flaw with public participation mechanisms derives from the listing process – and more specifically, the level of scientific evidence required for a successful nomination juxtaposed against the experience and expertise of community groups and the public. By way of illustration, consider an unsuccessful nomination at the Commonwealth level, relating to freshwater systems that was titled ‘Six Key Threatening Processes of Rivers and Streams’ and consisted of the following proposed KTPs: ‘Alteration to the Natural Flow Regimes of Rivers and Streams’; ‘Alteration to the Natural Temperature of Rivers and Streams’; Increased Sediment Input to Rivers and Streams Due to Human Activities’; ‘Introduction of Live Fish into Waters Outside their Natural Range After 1770’; ‘Removal of Large Woody Debris from Rivers and Streams’; and ‘The Prevention of Passage of Aquatic Biota as a Result of the Presence of Instream Structures’.¹²¹ The nomination failed due to lack of sufficient detail, particularly with respect to the level of impact on specific threatened species and/or ecological communities.

Although the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) envisages that a KTP can be listed if it ‘could’ cause native species or ecological communities to become extinct or endangered,¹²² the Scientific Committee still needs a sufficient level of evidence to make a determination in favour of a listing. This point is reinforced by the fact that in New South Wales, the New South Wales Scientific Committee, accepted for listing the nomination of

¹²⁰ Australian Council of National Trusts, *Submission to the Review of the EPBC Act* (2008) 20-22, 24-33 <<http://www.environment.gov.au/epbc/review/submissions/pubs/039-aust-council-of-national-trust.pdf>>.

¹²¹ Threatened Species Scientific Committee, Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee on public nominations of Key Threatening Processes under the Environment Protection and Biodiversity Conservation Act 1999 <<http://www.environment.gov.au/biodiversity/threatened/ktp/streams.html>>.

¹²² See ss 188(4)(a), 188(4)(b), and 188(4)(c) of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

‘Alteration to the Natural Flow Regimes of Rivers, Streams, Floodplains & Wetlands’.¹²³ Although this KTP was similar to one that the Commonwealth had already rejected, the information before the NSW Scientific Committee was considered sufficient to support the listing.¹²⁴ This scenario demonstrates that the public can be successful with their nominations, but the level of evidence needed might still be daunting for some sections of the community.

Notwithstanding these difficulties, the availability of participation mechanisms does at least provide an opportunity to generate public discussion. This differs from the declaration of prohibited lists where the public is largely shut out. In such cases, regulators run the risk that communities will question the level of transparency and accountability in the decision-making process, and become ‘antagonistic and alienated’.¹²⁵ This is an important consideration, given that large numbers of recent freshwater species have been introduced by members of the public as an unintended consequence of gardening and aquarium activities. Indeed, regimes dealing with aquarium species are unlikely to succeed without industry and community support.

Apart from the use of prohibited lists and KTPs, another common trend amongst the jurisdictions is the increasing use of policy instruments such as biodiversity strategies, biosecurity strategies and invasive species plans.¹²⁶ These strategies and plans are broadly-based instruments that can draw together diverse elements of the IAS regime. For example biodiversity strategies can integrate biosecurity policy, invasive species frameworks and protection of the environment. Victoria’s *Biodiversity Strategy 2010-2015 Consultation Draft* links with the *2009 Biosecurity Strategy for Victoria*.¹²⁷ Similarly, the *Draft New South Wales Biodiversity Strategy 2010-2015* acknowledges the deleterious impacts of invasive species and notes the need for a coordinated response with other initiatives, such as the *New South Wales Invasive Species Plan 2008*.¹²⁸

¹²³ Threatened Species Scientific Committee, above n 121.

¹²⁴ NSW Scientific Committee, Final Determination – Alteration To The Natural Flow Regimes Of Rivers, Streams, Floodplains & Wetlands – Key Threatening Process Listing (2002) New South Wales Department of Environment and Heritage <<http://www.environment.nsw.gov.au/threatenedspecies/AlterationNaturalFlowKTPListing.htm>>.

¹²⁵ Garnett, Ainsworth and Carey, above n 113, 37.

¹²⁶ Above n 83.

¹²⁷ Department of Sustainability and Environment, above n 83, 19-20.

¹²⁸ Draft NSW Biodiversity Strategy 2010-2015, above n 83, 86.

However, as with the formal listing of KTPs, the uptake of policy instruments is inconsistent. The Northern Territory and Western Australia, for example, are still to settle their biodiversity strategies and neither has adopted an invasive species plan. The fact the jurisdictions do not share similar strategies potentially creates a weak point in the IAS regime. States and Territories may be working towards different objectives, outcomes and targets, making it difficult to deal with KTPs and threatening processes in a consistent way. It also makes it difficult to determine whether regimes are achieving their objectives and targets – something that, ironically, is also the case with jurisdictions that have adopted overarching strategies.

Australia's Biodiversity Conservation Strategy 2010-2030, for example, has set an ambitious target to reduce the impacts of IAS by 10%;¹²⁹ yet other jurisdictions do not provide for such explicit outcomes. Victoria's biodiversity strategy expresses aims and outcomes in very general terms. The strategy highlights the need for a better coordinated response to IAS, especially in problem areas such as freshwater habitats, while also noting that measures to deal with IAS have thus far focussed on agricultural weeds and pest animals.¹³⁰

In a similar manner, the *Draft New South Wales Biodiversity Strategy 2010-2015* sets out general outcomes, encouraging regulators to use strategic approaches to IAS such as the listing of threatening processes and the use of threat abatement plans. However, the New South Wales Strategy also strengthens these general provisions by linking the *Biodiversity Strategy* with the *New South Wales Invasive Species Plan 2008-2015*,¹³¹ noting that regulators should aim to harmonise responses to IAS in accordance with the latter. The *New South Wales Invasive Species Plan* measures achievements by evaluating how the IAS regime reaches 'milestones' such as the development of instruments to manage IAS (including aquatic IAS), and the establishment of 'monitoring and control programs for selected widespread species'.¹³²

¹²⁹ Natural Resource Management Ministerial Council, above n 42, 46, Target 7.

¹³⁰ Department of Sustainability and Environment, above n 83, 19-20.

¹³¹ State of New South Wales, Industry and Investment NSW and the Department of Environment, Climate Change and Water, above n 83, Objective 10, page 15.

¹³² *Ibid*, 24.

A lingering problem that flows from these instruments centres on the different language and criteria the regimes use. This not only makes it difficult to assemble data on the achievements of each regime but also further complicates efforts to compare data that could otherwise be useful in developing consistent strategic targets and outcomes for Australia-wide IAS regulation.

In a practical sense, these shortcomings not only point to a regime in which regulators face difficulty in keeping pace with the magnitude and growth of the IAS problem, but also draw attention to the limitations of KTPs and other types of threatening processes as a regulatory tool. Given the ever-increasing rate of introduction of alien species, and the fact that invasive freshwater species are almost impossible to eradicate once they have established,¹³³ regulators need to reflect more deeply on how to improve the quality of their regimes. This will be challenging because, in addition to the difficulties just discussed, failings often stem from resource constraints that limit the ability of regulators to identify threats to biodiversity as well as to prepare and implement abatement and recovery plans. Irrefutably, the *Tasmanian Biodiversity Strategy 2002-2006* highlighted this very point, noting that while management plans have been developed to deal with a range of IAS, insufficient resources have been provided for implementation of the plans.¹³⁴

V RECOMMENDATIONS

To begin with, governments need to place more emphasis on preventing introductions¹³⁵ and improving capacity. Two suggestions are put forward: first, that the states and territories develop lists of permitted species; and second, that regulators investigate ways of making better use of existing resources.

The first suggestion is based on the approach adopted by the Commonwealth government subsequent to the promulgation of *Quarantine Proclamation 1998* (Cth), and has already been

¹³³ Australian Capital Territory Government, Territory and Municipal Services, above n 83, part 3.1.

¹³⁴ Tasmanian Government, above n 83, 36.

¹³⁵ *Invasive Plant and Animals Policy Framework* (2010) Department of Primary Industries <<http://www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds/protecting-victoria-pest-animals-weeds/invasive-plants-animal-policy>>.

identified elsewhere as a helpful means of enhancing IAS regulation.¹³⁶ The use of permitted lists means that alien species can only be imported once their safety has been evaluated. Accordingly, these lists operate in a preventative manner by stopping potentially harmful species from gaining entry. This indeed is where the value of permitted lists lies – in their capacity to guide regimes towards identifying potential threats posed by IAS. Another benefit flowing from using these lists is that they can be harmonised nationally, leading to uniformity of regulation. This would discourage stakeholders from trading, transporting and spreading unauthorised species across Australia. However, one drawback of permitted lists is that they do not deal with IAS already present in a jurisdiction. Hence, existing methods for eradication and containment of declared or listed species would need to operate in conjunction with lists of permitted species.

With respect to capacity building, decision-makers should consider ways of making smarter use of available ‘capital’. For example, the diversity of methods by which regulators identify threatening process and abate threatening processes represents a rich storehouse that can be tapped in many ways. Consequently, KTPs and less formal threatening processes may be identified by extrapolating information from instruments such as nominations and recovery plans for threatened or endangered species. In NSW, the nomination for the Booroolong Frog and Macquarie Perch both identify trout predation as a likely factor in the decline of these species.¹³⁷ This fact should act as a trigger for treating the introduction of alien fish species, and particularly trout, as a KTP, or other category of threatening process. The Tasmanian government, in fact, has already acknowledged the usefulness of such techniques.

The Tasmanian *Threatened Species Protection Act 1995*(Tas) accommodates the listing of threatened and endangered species, although it does not provide for the listing of KTPs.¹³⁸ A recent review of the management of threatened species in Tasmania concluded that the focus on individual species was too narrow and recommended that regulators should consider adopting

¹³⁶ Moore, Marton and McNee, above n 26, 1.

¹³⁷ *Booroolong Frog – Endangered Species Listing – NSW Scientific Committee, Final Determination* (2012) New South Wales Department of Environment and Heritage <<http://www.environment.nsw.gov.au/determinations/BooroolongFrogEndSpListing.htm>>; Fisheries Scientific Committee, *Final Determination: Macquaria Australasica – Macquarie Perch* (2008), 3-4 <http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0017/251342/FD37-Macquarie-perch.pdf>.

¹³⁸ See above n 57.

threat abatement strategies, including the development of a state strategy for ‘introduced pest species’.¹³⁹ The government’s response has been to agree to identify KTPs from existing recovery plans.¹⁴⁰ In this way, KTPs extrapolated from recovery plans can provide a means of identifying threatening processes even in those jurisdictions that do not proffer formal listing procedures for them.

The New South Wales government, which does allow for the listing of KTPs, has adopted a somewhat analogous procedure to deal with a backlog in the preparation of threat abatement and recovery plans. It is a matter of some irony that the listing processes established under the *Threatened Species Conservation Act 1995* (NSW) have apparently been too successful and the accumulation of unprepared plans meant that the government needed to find an alternative regulatory path. In 2007, the Department of Environment and Climate Change initiated a system called the *NSW Threatened Species Priority Action Statement* (PAS).¹⁴¹ The PAS is based on 34 of the most functional recovery and threat abatement strategies, a selection of which is adopted for each threatened species and KTP. Accordingly, the PAS identifies commonalities from the 34 strategies and, in similarity to the system endorsed by Tasmania, it can detect KTPs and provide a framework for abatement even though the KTP has not been formally listed.¹⁴²

Regulators can also consider developing new threat abatement plans by using information mined from existing plans. At the time of writing, more than half the KTPs listed under the *Threatened Species Conservation Act 1995* (NSW) were also listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and approximately half of these also had threat abatement plans prepared.¹⁴³ Consequently, these instruments provide a wealth of knowledge, information and recommendations that can be adapted for local conditions.¹⁴⁴ Similar techniques

¹³⁹ Parliament of Tasmania, above n 114, Part 4.

¹⁴⁰ Government of Tasmania, Response to the Management of Threatened Species Audit Report (Tasmanian Audit Office Special Report No. 78), Resource Management and Conservation Division, Department of Primary Industries, Parks Water and Environment (2010), 4 <[http://www.dpiw.tas.gov.au/inter.nsf/Attachments/LJEM-8AC3RH/\\$FILE/TS%20Audit%20Response.pdf](http://www.dpiw.tas.gov.au/inter.nsf/Attachments/LJEM-8AC3RH/$FILE/TS%20Audit%20Response.pdf)>.

¹⁴¹ Department of Environment and Climate Change NSW, *NSW Threatened Species Priority Action Statement (PAS) DECC* (2007) <<http://www.environment.nsw.gov.au/resources/threatenedspecies/threatspepcpas07168.pdf>>.

¹⁴² *Ibid*, 1, 19.

¹⁴³ At the Commonwealth level, there are 19 KTPs listed and 13 threat abatement plans approved. For discussion see New South Wales Department of Environment and Climate Change, above n 141.

¹⁴⁴ *Ibid*, 19.

can apply to a range of management plans and strategies that refer to IAS or establish measures for their abatement.

Finally, regulators should not overlook how they can make better use of human resources. Effective engagement with stakeholders is important to the success of regimes. This is especially the case where changes in the law, such as the development of permitted lists, call for prohibitions on the introduction or use of species that hitherto had been legal. If regulators are insensitive in their approaches, regulation will likely be unsuccessful. Indeed, lack of stakeholder engagement is often cited as a reason for regulatory failure in the context of the aquarium industry.¹⁴⁵

VI CONCLUSION

This paper has discussed the variety of ways that regulators use KTPs and other threatening processes to manage freshwater IAS. Each measure is essential to the IAS regime, yet no sole measure can successfully grapple with the problem of IAS. In reality, the effectiveness of KTPs and other threatening processes depends not only on the value of the individual processes, but also on their effectiveness within the entire IAS regime. Moreover, as regulators try to come to grips with gaps and inconsistencies in the IAS regime, they must also address resource constraints that make the design and implementation of measures all the more difficult.

These issues are linked by the need for regimes to become more proactive in identifying and dealing with the potential of species to become IAS. This is especially important in freshwater jurisdictions, where control and eradication of IAS is a complex process. Indeed, by regulating the potential of species to become IAS, regulators can enhance the performance of the IAS regime as well as providing a more cost effective way of dealing with these difficult species.

One suggestion proffered is the development of lists of permitted species. This has the advantage of evaluating species prior to entry, helping to identify and prevent introductions of potential IAS. Yet to be truly effective, the operation of permitted lists needs to be considered in a broader

¹⁴⁵ Natural Resource Management Ministerial Council, above n 99, 1.

cross-jurisdictional context that takes into account additional areas of regulation such as biosecurity, weed regulation and invasive species control.¹⁴⁶ The second proffered suggestion centres on ways of making better use of resources by identifying KTPs and other threatening processes from existing initiatives. One benefit of this system is that it can mimic some of the more useful techniques derived from the listing and abatement of KTPs, such as the identification and abatement of pathways of invasion. In similarity with the development of permitted lists, targeting pathways of invasion can promote measures that deal with the potential of activities to introduce IAS. Moreover, targeting pathways can also engage with the human element of introductions – the ‘how’ and ‘why’ of introductions. In reality, addressing the human element is vital for the effectiveness of any IAS regime. For without this component even the best constructed regimes will fail.

¹⁴⁶ Paul O. Downey and Andrew R. Leys, ‘Weeds as Key Threatening Processes: Implications for Managing Environmental Weeds’, in B. M. Sindel and S. B. Johnson (eds), *14th Australian Weeds Conference Proceedings: Weed Management – Balancing People, Planet, Profit* (2004, Weeds Society of New South Wales) 454, 456.