

Joint submission to the Productivity Commission Issues Paper Barriers to Effective Climate Change Adaptation



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Acknowledgements

The Queensland Seafood Industry Association (QSIA) has actively engaged in helping to facilitate a better understanding of climate change issues at a State and National level. This submission demonstrates the ongoing positive relationship between sectors of industry to help identify the barriers to climate change adaption in the context of fisheries and conservation management. The issues are complicated and require joint industry and government solutions.

The QSIA wishes to thank Helen Jenkins (Executive Officer, Australian Prawn Farmers Association), Lowri Pryce (Executive Officer, Oceanwatch), Ryan Donnelly (Pro-Vision Reef) and Wil Conn (Industry Recovery Officer - Cyclone Yasi, Seafood and Aquaculture Industries) for their contributions to this submission. The QSIA would also like to thank industry and researcher contributions to earlier versions of the submission¹.

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1. Introduction

1.1. Queensland Seafood Industry Association

The Queensland Seafood Industry Association (QSIA) is the peak industry body representing the Queensland Seafood Industry. Our members include commercial fishers, seafood processors, marketers, retailers and other businesses associated with the seafood sector across the State. Our representation to members and the community at large is to promote the consumption of wild caught Queensland Seafood.

According to the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) in 2009-10, the gross value of fisheries production in Queensland increased by 6% (\$17.1 million) in 2009-10 to \$323.7 million; wild-catch production accounted for \$222.5 million, or 69%, of this value. The aquaculture sector accounted the remaining \$101.2 million².

1.2. Australian Prawn Farmers Association

The Australian Prawn Farmers Association (APFA) was formed in 1993 to represent the interests and foster the development of the Australian prawn farming industry. The APFA is a key contact for investors, new farmers and firms wishing to do business with the Australian prawn farming sector.

The Australian prawn farming industry now produces more than 5,000 tonnes (2011) of product annually with a farm gate value estimated to be in excess of \$85 million, providing more than 1,000 direct jobs and 1,800 indirect jobs. The Australian industry is one of the smaller volumetric producers in the world but leads the world in productivity with an average yield of more than 8,000 kg per hectare. Farms are currently located in two Australian states, New South Wales and Queensland.

The APFA provides the link for communications between growers and related sectors including infrastructure suppliers, the finance sector, retailers and exporters, technologists, researchers and all levels of government. Members grow two types of prawns; *P.Monodon* and *P.Merguensis* and according to the Department of Employment, Economic Development and Innovation (DEEDI); the Aquaculture production survey Queensland 2009-10 there are only 23 producing farms in Queensland. There has been no new farm development for the past 10 years³.

1.3. Oceanwatch Australia

Oceanwatch Australia (OWA) is a national not-for-profit environmental company that works to advance sustainability in the Australian seafood industry. OWA works in partnership with the Australian seafood industry, federal and state governments, natural resource managers, business and local communities. OWA has three funding sources; a voluntary contribution from the seafood industry, federal and state government grants and through fundraising activities. OWA has three members; the Master Fish Merchant of Australia, the Sydney Fish Market, and the NSW Fishermen's Cooperative Association.

1.4. Pro-vision Reef

Formed in 1992, Pro-vision Reef is the peak body representing licensed operators in the Queensland Marine Aquarium Fish Fishery, the Queensland Coral Fishery and the aquarium

² ABARES (2011, p.11).

³ Wingfield and Willett (2011, p.11).

sector of the Commonwealth Coral Sea Fishery. Membership accounts for 80% of active participants in the fisheries.

Pro-vision Reef aims to promote sustainable reef harvest and, in so doing, to promote community and market confidence in our industry. The association conducts projects that demonstrate resource custodianship and promotion of ecologically sustainable practices in our fisheries. To achieve this, we have adopted a strategic approach and nurtured a culture of collaboration.

In 2010, Pro-vision Reef undertook a comprehensive climate change vulnerability assessment of the aquarium supply industry in Queensland. That study will inform the implementation of a climate change adaptation plan. The plan aims to further mitigate fishery risk to the biological systems that underpin the fishery; and to augment the capacity of participating businesses to manage change.

1.5. Submission Structure

The following submission provides both a wild harvest and aquaculture industry perspective on the myriad of barriers to effective climate change adaptation. The QSIA, APFA, OWA and Pro-vision Reef are pleased to make a joint submission to the Productivity Commission (Commission) to provide a whole of seafood industry perspective on this very important public policy issue.

2. Background

2.1. Industry Structure

The Australian seafood industry is extremely diverse and enterprises range from low-technology single-owner-operators, for whom the lifestyle is important, to large vertically integrated companies that operate solely for profit. The industry provides important economic and social benefits within coastal communities. More than 800 seafood species are commercially harvested and sold in Australia for local and overseas consumption, under about 300 marketing names.

Australia's maritime zone is one of the largest in the world, covering about 14 million square kilometres: about twice the area of Australia's landmass. The zone contains about 4,500 known species of finfish (and perhaps tens of thousands of invertebrate species), most in relatively small numbers.

The aquaculture industry's potential economic and environmental contribution to the community is substantial and prawn farming is now one of the largest aquaculture sectors in Australia behind Tuna and Salmon. Enormous opportunity remains for new areas of development and growth in grow-out, hatchery, processing, marketing and service sectors. The gross value of production (GVP) for the wild harvest and aquaculture sectors are outlined in Table 1.

Table 1
Wild Harvest and Aquaculture GVP (\$ millions)

Species	NSW	VIC	QLD	WA	SA	TAS	NT	Commonwealth
Wild Harvest	80.5	47.8	222.5	271.9	201.4	171.6	31.2	\$316.7
Aquaculture	52.4	10.3	101.2	95.8	193	392.2	25.5	-

Source: ABARES (2011, pp.8-16).

The Queensland commercial fishing industry is a diverse mixture of State and Commonwealth managed fisheries; there are both inshore fisheries (e.g. net and pot fisheries) and larger offshore (e.g. line and trawl fisheries).

The operating environment in which commercial fishers undertake their business is multi-faceted. For example, some fishing permits for trawling allow for unrestricted east coast access (e.g. T1 and T2) while others (e.g. M1, M2) restrict trawling to a defined area such as Moreton Bay⁴. Regional management being a likely future management tool will add to the complexity of operations for commercial fishers that will have a new set of challenges when faced with significant climatic events such as cyclones and floods.

2.2. Need to Engage on the Climate Change Issue

In recent years, the Australian community has become increasingly aware of the need to protect natural aquatic resources (ocean, estuary, river, wetland and other habitats), maintain biological diversity and processes in ecosystems that support fisheries and aquaculture. The impacts of land-based activities including urban development as well as major port developments that are, frequently transferred to marine, estuary and coastal environments by run-off and rivers, are also of concern to the seafood industry and the community.

⁴ Fisheries Queensland (2011).

There has been a near saturation in the print and television media about the primary driver of climate change - increased greenhouse gas emissions - and the flow-on effects that have been documented in the terrestrial and marine environment. Add to this a robust political debate on how as a nation we should address climate change and then superimpose global activity (or inactivity) and the climate change debate 'noise' threatens to overshadow the near-term impact of climate change on the marine environment, people and business. As an important sector for Queensland, the fisheries and aquaculture operations are well aware of the importance of environmental variability on their businesses, and have developed a range of coping strategies for this natural variability. Awareness of climate change is also high, but this is only one of many issues that our businesses must consider to ensure future sustainability.

How climate change will further impact these biological processes is of great concern to OWA. In response we are working with Universities across Australia on developing adaptation measures. OWA has further concerns that adaptation measures occurring on land may further compound processes in our aquatic environment, thus affecting seafood production.

Given the projected changes in Queensland waters as a result of climate change, autonomous adaptation (driven by individual businesses) is expected - just as the industry has always adapted to external drivers. The increased importance of directed adaptation (driven by policy changes) is also recognised by our industry. Thus, recognising barriers to both autonomous and directed adaptation is a critical concern. Table 2 provides some climate change impacts as they relate to ocean temperatures.

Table 2
Marine Climate: Temperature

What is happening?	Ocean temperatures around Australia have warmed 0.7°C since 1910-1929, with south-west and south-eastern waters warming fastest (HIGH confidence)
What is likely to happen in this century?	Australian ocean temperatures will be 1°C warmer by 2030 and 2.5°C warmer by 2100 (HIGH confidence), with the greatest warming in south-eastern waters (HIGH confidence)
Addressing knowledge gaps	Expand ocean climate observations to validate other datasets, ground truth satellite observations, verify models and improve understanding of ocean processes and heat fluxes
Key adaptation options	Climate change requires immediate and vigorous international diplomacy to reduce greenhouse gas emissions. According to the 2007 Intergovernmental Panel on Climate Change Fourth Assessment Report, global greenhouse gas emissions have increased by 70% between 1970 and 2004. Some level of future climate change is already certain (e.g. 2°C of warming) because of the greenhouse gases already in the atmosphere. A delay in reducing human-related emissions will result in even greater levels of climate change and subsequent impacts on marine species and habitats. Adaptation options for marine climate change need to focus on conservation responses to increase resilience of our marine biodiversity as well as adapting our businesses and practices.

Source: Commonwealth Scientific and Industrial Research Organisation ((CSIRO), 2009).

3. Key Issues

The Commission has provided a number of questions for consideration. Given the complex nature of the questions industry responses will not compare barriers across sectors but examine the salient contextual factors that have created barriers to adaptation.

An important question facing the commercial seafood industry⁵, fisheries and conservation management agencies is how do you measure successful adaptation? What is the most appropriate metric:

- Is it financial;
- Is it social; or
- Is it environmental?

3.1. Uncertainty⁶

- How is effective adaptation best defined? How can it best be assessed? In other words, is the rate of adaptation 'too much' or 'not enough', 'too soon' or 'too late'? What other considerations may be relevant for maximising the net benefits to the community from adaptation?
- What kinds of adaptation to climate change (and variability) have proven most effective to date?
- How can uncertainty be addressed in the context of adaptation to climate change?

QSIA Response

The Commission's Issues paper has cited multiple definitions provided by the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Development Program (UNDP) which focus on (a) prevention and immediate response, (b) the private and public spheres in which adaptation can take place and (c) responses to adaptation being self-directed and intentional.

Communication can overcome some uncertainty, but only if the answers are known. One barrier is providing information to our industries on key questions such as those provided above. Adaptation is an ongoing process of change that industries and businesses will need to engage in as part of a strategic response to climate change.

Why ongoing and strategic? Adaptation (from a business perspective) is not an end state but an ongoing concern to minimise impacts on the environment and where possible search for positives for the business (e.g. energy savings and/or reduced production costs). Strategic in the sense that climate change will bring species and marine ecology changes and these in turn will influence how commercial operators will do business into the future.

⁵ These questions stem from the climate change and environmental work undertaken from a Queensland perspective. The QSIA has for the past 3 years attempted to take a lead on the climate change issue but not in isolation. The QSIA has been fortunate to have industry and government support through partnerships and funding to help illuminate the complex policy and operational issues stemming from the climate change phenomenon.

⁶ Productivity Commission (2011, p.7).

Coupled with legislative change (e.g. operating under a carbon tax) and it is clear that industry needs to respond. Examining the rate of adaptation is of little value to our industry if it does not account for specific industry variability.

The issue of uncertainty in the absence of 'absolute certainty' can be addressed through risk management approaches which assist fishery industry stakeholders to understand climate change impacts and identify possible adaptation responses. Through these processes businesses and fishery managers can plan their responses strategically to minimise the risks and maximise the opportunities that climate change impacts present in the short, medium and longer term.

The vulnerability assessment project conducted for the East Coast Otter Trawl Fishery in Queensland is an excellent example of all stakeholders in a fishery collaborating to develop adaptation plans. Fishermen, QSIA, Fishery Managers, Great Barrier Reef Marine Park Authority (GBRMPA) and Fishery Scientists have worked together productively to bring all relevant expertise to bear in planning for adaptation, using a risk management process (the Climate Change Risk Management Matrix) to guide discussions⁷. This model has application to other fisheries, where there is good will between stakeholders to work together to achieve sound climate change adaptation planning outcomes.

The QSIA and the GBRMPA have recognised this and are working together to ensure industry can better prepare itself for the impacts of climate change. The QSIA and GBRMPA formed a climate change and fisheries partnership in 2009 and work with fisheries management to ensure a sustainable future for the Great Barrier Reef (GBR). The QSIA has various roles within key fisheries bodies that help shape the long-term health of the environment as it relates to the GBR. Some of these bodies include:

- Ecosystem Reef Advisory Committee: a high level strategic policy setting body that advises the GBRMPA.
- Reef Guardians Fishers: a stewardship recognition program designed to encourage and showcase those fishers that undertake actions, above and beyond what is legally required, to minimise their impact on the Great Barrier Reef Marine Park
- Burdekin Regional Management Project: local fishers at the forefront of moves to manage fisheries issues with all stakeholders.

These ongoing actions demonstrate willingness by the commercial seafood sector to continue to advocate the protection of the GBR through participation in strategic policy setting groups, by educating the community on how industry/fishers work within a sustainability context and by acknowledging that adaptation requires cooperation amongst different stakeholder groups.

In the wild harvest sector uncertainty associated with climate change is likely to be much greater than that associated with past climate variability. The research sector has already predicted that climate change will impact on Australian fisheries.

Efforts by our industry to understand these impacts have been widespread. For example, at a QSIA-led symposium in 2011, a range of issues were discussed (e.g. Figure 1).

⁷ Cobon et al (2009).

Figure 1
Implications of climate change for Fisheries and Management

Implications for fisheries and management

- Climate change will impact fishing and aquaculture (maybe has already)
 - General ocean warming around Australia, particularly on the east coast due to strengthening of the East Australia Current, is predicted to change the location of suitable environments for fishing and aquaculture.
- Understanding changes in environmental conditions will enhance adaptation by businesses
 - Management and policy changes may be needed to allow appropriate responses by marine industries.
- Need local information in order to plan
 - Selective breeding will adapt some aquaculture species
 - Changes in location may be required for some businesses
- Need new partnerships to be “adaptive”

Source: Hobday (2011).

Without a fixed point in time Hobday (2011) notes that stakeholders using the marine resource will need to consider business planning implications. Moreover, fisheries and conservation management will need to consider their policy responses as conditions change.

The information presented by Hobday (2011) implies a degree of uncertainty with respect to specific timing of climate change impacts. As weather patterns vary and as noted by Hobday (2011) a general trend towards ocean warming will have implications for the seafood industry as change takes place in the marine environment thus on species targeted for commercial harvest. Without linking an impact to a future known point in time.

Hobday (2011) also notes that stakeholders using marine resources will need to consider business planning implications. Moreover, fisheries and conservation management will need to consider their policy responses as conditions change.

Communication and a simple articulation of the adaptation message remains a clear need in industry⁸.

APFA Response

APFA were funded through the Department of Agriculture, Fisheries and Forestry (DAFF) to undertake 'Prawn Farmers responding to Australia's changing climate' this project's aim

⁸ It could be argued that communications falls under bounded rationality as defined in the Commission's issues paper.

was to undertake farm audits of energy usage as this is a major cost and barrier to business that farms have to deal with.

Pro-vision Reef Response

The projected biophysical impacts of climate change have been poorly communicated to the wider population. Science is characterised by debate and disagreement but there are core messages upon which there is broad agreement and it is these messages that could have been fashioned into a high level communications strategy. As a result of the manner in which communication has been handled, scepticism and outright denial still exists in the community.

Despite the challenges that this presents, the aquarium supply sector in Queensland has made significant progress in adaptation planning or at least adaptation thinking. Industry engagement has highlighted the various factors that impact upon a business-as-usual approach in the context of climate change. These have included the realignment of priorities for the management agencies that oversee the fishery and the area in which the fishery operates. It has included the impacts, in a cumulative sense, of carbon pollution mitigation policy that adds to the cost base in a globally competitive industry. We recognise these as being the most immediate effects of climate change.

The Pro-vision Reef climate change vulnerability assessment examined threats to the biophysical environment that underpins the fishery and the threats to commercial viability of businesses should changes to operating models become necessary for whatever reason. This was an incremental approach to engage industry in a process that they could own.

With input from respected marine scientists, we identified fish species that are critical to reef recovery after disturbance and coral species that are critical to structural complexity on reefs, which assists the retention of biological diversity. We adapted our existing Stewardship Action Plan to include collection standards for these species, including not collecting them at all at certain times and places. And we took the species identified in fishery ecological risk assessments and applied collection standards specifically to those species in order to mitigate identified fishery risk.

The Stewardship Action Plan also strengthened the existing collaborative arrangement with fishery and marine parks managers in the event of natural catastrophe. That arrangement integrates fishery operators into the process of management response and again offers the fishers ownership rather than simply being the recipient of a management response at the end of a pipe.

The benefit of this approach to biophysical challenges is that ecological risk assessments are carried out periodically and that, as a result, our stewardship initiative is updated to coincide in a continuous improvement cycle. Members of the association gain a clearer understanding of the climate change related risks, including bleaching, cyclones and flooding, to their fishery and the reasons why standards are in place to mitigate those risks. Managing change and retaining viable businesses is the other component to emerge from the vulnerability assessment.

Whilst our fisheries are managed by the Queensland government, operators are permit holders in the Great Barrier Reef Marine Park and are much more vulnerable to changes in marine parks management than fishery management.

Through the vulnerability assessment operators are now fully aware of the management priorities of protecting reef resilience so that reefs are better equipped to recover after disturbance. They are now aware that this could include the use of temporary or permanent spatial closures that could impact upon the cost structures and required revenues.

Our approach to this is to model various scenarios and the impacts on required revenues. The aim is equip operators with the requisite information to make any adjustments to business practices as might be necessary. This could include adjustments to scale, specialisation, diversification or even examining succession planning options.

3.2. Barriers⁹

- What is the most useful way to classify, define and identify barriers to adaptation? Are the categories set out above appropriate? Are there other types of barriers?
- What market failures could inhibit adaptation in any specific sector or region?
- Are there examples of policy or regulatory barriers that could inhibit adaptation? What are these? Could the objectives of these policies or regulations be met in alternative ways that have greater benefits and/or lower costs and distortions?
- What other significant barriers (for example, behavioural or organisational) might inhibit adaptation? What effects might these have on decisions about whether and how to adapt to climate change?

QSIA Response

We recognise barriers as obstacles that can be overcome with planning and action from individuals or policy and management changes. At present the barriers facing commercial fisheries across Australia remain largely unknown, although we are working to identify these.

From a commercial fishing industry perspective the classification, definition and identification of barriers to adaptation will vary across commercial fishing sectors. A perceived barrier to fishers simply following changing species distributions (e.g. trawl operators in the East Coast Otter Trawl fishery) could be the high cost of fuel¹⁰, which may require changes in fuel use patterns. Conversely, for an inshore fisher in the pot or net fisheries, spatial limits to fishing may be a barrier when fish stocks change distribution.

It should be noted that the categories noted in the Commission's issues paper provide a broad sweep of barriers that might exist in industry. Three additional barriers should be considered by the Commission; (1) climate change legislation¹¹ and (2) negative media coverage of the climate change issue¹² and (3) greater coverage of scientific organisations and their work on climate change¹³.

⁹ Productivity Commission (2011, p.11).

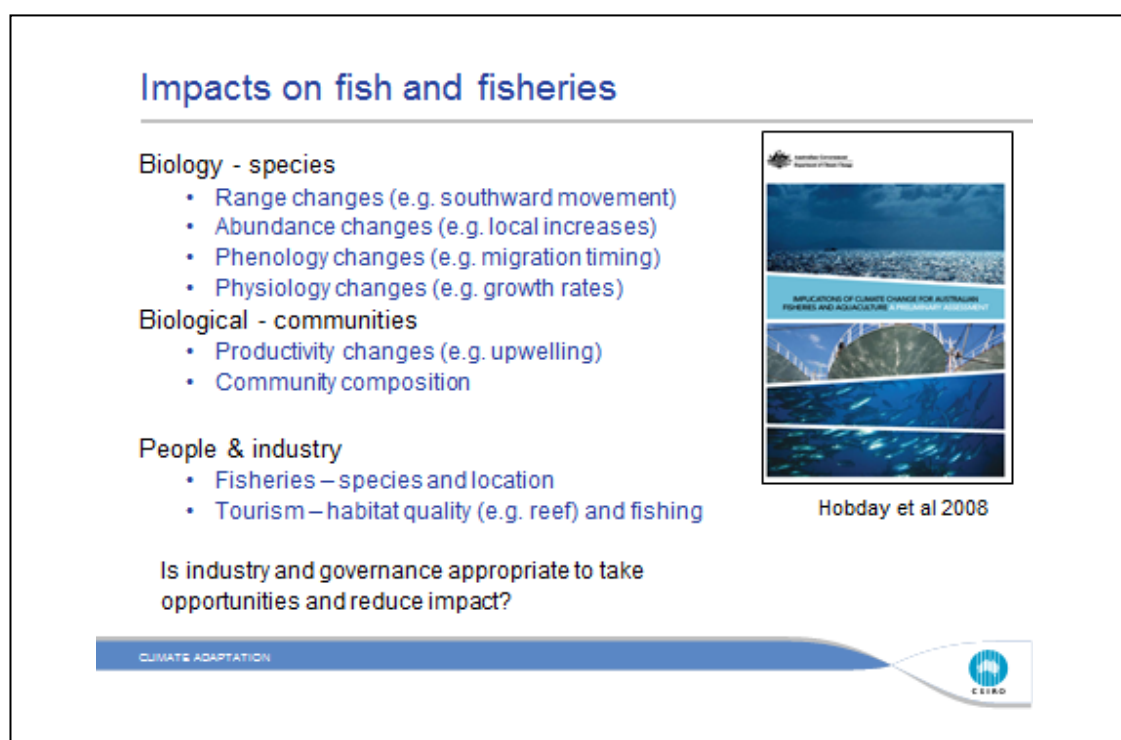
¹⁰ Trawl vessels have very few fuel alternatives and the cost of fuel is a critical concern for trawl vessel operators. This is applicable to any large commercial fishing vessel that operators beyond inshore fishing limits.

¹¹ With the introduction of a price on carbon the commercial seafood sector must now factor indirect rises in the cost of doing business as a result of the tax.

From a legislative perspective the carbon tax system, while directly targeting large scale polluters in the economy, may also impose indirect costs to Australian business. It is unclear what the cost impacts will be in the short, medium and long-term on a significant cross section of the commercial fishing sector - what are the potential energy costs increases for cold storage; and increases in freight costs (road and air)? The market failure is that the impacts on the commercial seafood industry are relatively unknown at a local, regional and State level.

Climate change is set to have species level and marine environment impacts which in turn will have industry impacts; see Figure 2. In a future scenario, will conservation management agencies at the State and Federal levels reconsider Marine Park zoning in the face of climate change?

Figure 2
Impacts on Fish and Fisheries



Source: Hobday (2011).

In a future where marine species, their environment and industry will feel climate change impacts and where Australia is proceeding with national marine parks with the almost certain complementary zoning by State based conservation agencies governments will need to consider the following:

- Can conservation legislation allow for zoning changes that permit commercial fishing in different zones, and can this zoning be flexible in space and time? Current conservation zones may also need to move, just as fishers may need to change location.

¹² The public attacks on both pro and anti-climate change scientists has blurred the debate to the extent that both public and industry debates are based on fights amongst the media and politicians and not the best available scientific evidence.

¹³ Work of highly reputable scientific agencies such as the CSIRO require greater promotion in the public arena.

- Will conservation agencies at the State and Federal levels truly apply co-management to enable industry to survive changes in species and where they can be harvested?
- As food security issues take on greater importance how will the need to ensure food production effect how marine parks function? That is, can existing Marine park legislation be tailored to assist industry?

Flexibility is deemed as an important factor for industry adaptation responses and is equally important for the legislative environment within which fisheries operate as inflexible legislation that can hinder adaptive capacity. For example, the introduction of marine parks across Australia. The Queensland seafood industry will believe the Federal and State governments are serious about adaptation when they start managing marine resources on their ecosystem health and minimising impacts on legitimate users of the resource, not on rigid boundaries and no go zones when even the fish have moved somewhere else due to climate change. The primacy of the preservationist movement on the political agenda on fisheries and conservation management is clear. The political fear that is generated by the preservationist movement has skewed climate change policy making that political decision makers are also a barrier to effective climate change.

Adaptation and fisheries management arrangements across most of our fisheries are regulated through input controls. Add to this pressure in some fisheries (e.g. Queensland line fishery) where fisheries management must strike a balance between the commercial and recreational sector in terms of resource sharing. The Queensland experience has been one of resource exclusion not resource sharing. Fisheries management has become more and more politicized and more difficult to achieve rational and outcome based approaches. This is a critical impediment to adaptation as trust in fisheries management decisions, in the Queensland context, is at historic lows, why would industry want to adapt?

APFA Response

As previously stated, the APFA are seriously concerned with continued steep rising energy costs.

How will this future play out for Australia's prawn farmers? Prawn farmers have large power bills - so they have an incentive to closely examine their energy use, and the sheer scale of their usage may present opportunities usually denied to other rural industries. Drawing on the expertise of CSIRO's Energy Transformed Flagship, this project examined energy use on a number of Queensland prawn farms in the context of Australia's 'Clean Energy Future'.

The results show that annually, a 50 ha prawn farm uses around 4 gigawatt hours of electricity. Other studies have shown that energy is only a fraction of the cost of production. Prawn farms use large amounts of energy because they are large enterprises. At its peak a 50 ha farm needs just over 1MW of electricity and most of that is consumed in all-day, every-day pond aeration of numerous intensively stocked 1 ha ponds.

How soon could farms access 1 MW of renewable energy? The industry's location fits well with alternative energy maps, but sources like wind and solar are not an obvious fit with the demands of continuous pond aeration. Electricity tariff structures strongly penalise daytime use of electricity- daytime or peak use will make or break green power on prawn farms. APFA analysis shows that a small power station burning sugarcane trash or other biomass (akin to a sugar mill burning bagasse) is already competitive with daytime electricity tariffs -

but farmers may be daunted by the prospect of fuelling, staffing and operating a boutique-sized power station. Daytime power tariffs only have to rise a few more cents before they bring solar photovoltaic (PV) arrays into play. The 50 ha farm still has to find room for ~2 ha hectare of solar PV panels. Other solar and renewable energy technologies are on the horizon but it might be some time before we see them powering prawn farms.

A solar PV equipped prawn farm still needs the local power grid to access cheaper night off-peak power, and as a back-up supply (e.g. cloudy days). An obvious challenge is that the expensive peak period carries into the early evening- after sunset. But if diffuser biofouling can be solved, sunshine may well be “stored” as compressed air and used in ponds during the evening peak, or even to provide round-the-clock emergency pond aeration.

OWA Response

Behavioural barriers - two of the OWA's programs work directly with fishermen and aquaculture farmers on the ground; Tide to Table an east coast program which involves activities to enhance fish habitat and water quality (also involves communities and landholders), and SeaNet the national, environmental extension service to the seafood industry.

From these two programs, we observe and note that most of the harvest sector operates in a dynamic, highly variable marine environment, where being responsive to change - be it environmental, social, political or economic - is critical. The post harvest-sector is also dynamic, as would reflect a perishable goods sector, requiring fast solutions to issues connected to product quality, such as transport and refrigeration. However changing practise and behaviours within the harvest or post-harvest sector is difficult, slow, and requires industry trust in the facilitators, proof of the concept and certainty of the outcome.

Climate change science does not meet these challenges and therefore the concept itself is a barrier. Overcoming behavioural barriers in our stakeholders is core to the OWA mission. OWA fosters and maintains communication and constructive relations with all its stakeholders. In particular, it aims to build good working relationships with all levels of government to ensure the environmental concerns of the Australian seafood industry are understood and taken into account by policy makers.

Pro-vision Reef Response

The most conspicuous barriers to climate change adaptation involve managing potential upheaval to business practices through pre-emptive and precautionary management of the Great Barrier Reef; and the actual changes to the cost base as a result of carbon pollution mitigation policy.

The number on priority of the agency that overseas the conservation of biodiversity on the Great Barrier Reef is to build and maintain resilience such that coral reefs are better able to recover after disturbance. Whilst we support this approach, we interact directly with coral reefs so spatial separation of reefs from aquarium supply fisheries in support of that aim changes the manner in which businesses operate.

The actual barrier to competitiveness relates to a disproportionately high cost base that will further increase in the future. Participants in these fisheries maintain filtration facilities on shore that use a lot of electricity. Costs have risen appreciably in recent years but will rise substantially more under a carbon price. Alternative sources of power generation could take years to become available to the grid. In the meantime, on site generation at the consumer level requires capital investment beyond the reach of many small businesses.

An important barrier occurs at the enterprise level if individual proprietors do not consider that there is anything to adapt to. The approach that Pro-vision Reef has taken to circumvent this involves emphasising the actions of governments and the effects on the market that result in changes that require adaptation. Changes to the biophysical environment, such as reduced biodiversity have been expressed but this is not the key message yet. In an incremental process, it will be built upon as engagement deepens.

3.3. Regulatory Reforms¹⁴

- Which broad-based reforms also offer potential benefits for facilitating adaptation to climate change?
- What taxes affect the mobility of capital and labour and may therefore affect adaptation?
- Are there any other impediments to capital and labour mobility that are particularly relevant to adaptation? For example, if climate change results in some jobs or business activities no longer being viable, or less profitable, is there anything that discourages businesses or workers from changing locations, undertaking new economic activities, or changing occupations?
- Are there any other taxes or regulations that may affect adaptation decisions?
- What other reforms would improve the overall flexibility of the Australian economy and thus contribute to efficient adaptation?

QSIA RESPONSE

With the introduction of a carbon tax regime and as an industry that is likely to feel indirect impacts; any potential benefits on an industry-wide and community basis will come from fishers actively looking to save fuel and energy costs within their businesses.

Commercial fishing businesses will need to adapt to changes in fish distribution, calls from conservation and non-government groups to continue to examine fishing methods as climate change become more visible. Add to this legislation to create a lower carbon economy and an increase in operating costs will ensue.

Ongoing investment in the commercial seafood industry is declining. In Queensland there are multiple investment warnings in place which has had the effect of limiting investment by existing commercial fishers and does not make for an attractive industry environment for outside investors.

¹⁴ Productivity Commission (2011, p.15).

The seafood sector has experienced considerable loss of crew and their skills throughout the mining boom period. In 2009 the Resources and Engineering Skills Alliance (RESA) reported that, based on industry consultations, that mining stakeholders reported that they were experiencing:

- Continuing problems sourcing specialist professional, para professional and skilled trade's employees.
- Ongoing concerns at the relatively poor literacy and numeracy levels of school leavers and young people applying for positions with employers.
- Some attraction and retention pressures from the emerging mega-projects in Western Australia and Queensland.
- No shortages of applicants/labour for entry level and semi-skilled positions.
- No shortages of applicants for apprenticeships¹⁵.

The Commission notes that government can play a critical role in developing a market for industry in which to operate:

For example, in the case of Australia's water resources, Australian governments have improved the flexibility and efficiency of water markets by strengthening property rights and removing barriers to trade. This has provided incentives for users to respond to changes in water availability and allocate water to where its use is most highly valued¹⁶.

The Carbon Farming Initiative (CFI) introduced by the Commonwealth is solely focussed on land based agriculture. Fisheries and aquaculture do not appear to be considered yet rivers, estuaries and wetlands are not just the connectors between marine and land but also the basis of all Australian fisheries habitat and thus stocks¹⁷.

APFA Response

Climate change adaptation in the prawn farm sector is entangled by barriers imposed by environmental regulation - as if the regulators think prawn farmers are dragging their feet over reforms. Yet, aquaculture is the most modern form of farming in Australia and the world. How young? When the Inter-Governmental Panel on Climate Change met for the first time in 1988, prawn farming was still in the hands of its first pioneers. For our prawn farmers there is no 'previous climate variability' - for them it turns out it has all been climate change.

The Commission produced a research paper for aquaculture in 2004 entitled, 'Assessing Environmental Regulatory Arrangements for Aquaculture', from the recommendations produced in this report nothing has changed over the last 7 years. In fact if anything the regulatory burden has increased.

¹⁵ Spoehr and Molloy (2011, p.2).

¹⁶ Productivity Commission (2011, p.14).

¹⁷ The CFI is a carbon offsets scheme that will provide new economic opportunities for farmers, forest growers and land managers while also helping the environment by reducing carbon pollution. Farmers and land managers will be able to generate credits that can then be sold to other businesses wanting to offset their own carbon pollution (<http://www.cleanenergyfuture.gov.au/carbon-farming-initiative/>).

This prompts the question about the validity of Commission reviews; they don't seem to deliver results back to the industry that requires change. The APFA is extremely concerned about the impacts of the newly introduced carbon tax.

Pro-vision Reef Response

The flow on effects of the carbon price, especially in the first few years, will likely affect the international competitiveness of small businesses. Australia's high standards of resource management, maritime safety, industrial relations and social equity are not matched in most of the regions of the world where our competitors operate. Their product is freely available in Australia and in our export destination markets. Through Pro-vision Reef, Australian suppliers have been able to differentiate their product in the market on the basis of provenance and quality. However, as that price disparity widens, our product will be priced out of the market.

In time, it is expected that asset values in the aquarium supply fisheries will go the way of other commercial fishing sectors. Entry into the commercial fishing industry has been limited for many years so new entrants must purchase existing rights, such as licenses and quota. As the operating environment becomes tougher and the margins more narrow, demand from new entrants dissipates and the value of the rights decline. This does not ignore the projected impacts of climate change on biodiversity. We see impacts on competitiveness, profitability and disposability as preceding the projected impacts on the environment that supports the industry.

Regulatory reform that could ease competitive pressure might include bold tax reform for small business. If small business was not shackled by cost and red tape, it would be easier to do business, to remain internationally competitive and to keep people employed. It is granted that revenue from the carbon tax will compensate households. But as marginal industry sectors struggle further for commercial viability, the compensation will be in addition to welfare payments. It would be better to make small business, which is Australia's largest employer, easier to operate and to keep people in work. This includes small businesses that grow from new opportunities in a carbon constrained economy.

3.4. Insurance Markets¹⁸

- Are any existing regulatory arrangements (including state based insurance taxes and disaster recovery policies) impeding the efficient operation of the Australian insurance market, or reducing incentives to take up insurance?
- What kinds of government intervention, if any, would be most appropriate for addressing any market failures or regulatory barriers? What are the costs and benefits of these interventions?

QSIA Response

Risk-based approaches to climate adaptation should be supported by institutional structures, such as insurance. Evidence from the Queensland seafood industry suggests that the further north you travel the less likely that insurance companies will offer insurance

¹⁸ Productivity Commission (2011, p.16).

for vessels or any large capital investments due to weather. Insurance that is available is prohibitively expensive and is seen as a poor investment for operators. Conversely a lack of insurance is a significant risk factor in the ongoing viability of many commercial fishing operations.

Since the floods of 2010/11 it is clear that operations along the Queensland coastline will increasingly become more expensive to insure. From an industry perspective the government could help through seed funding of industry based self-insurance schemes. Given the profitable businesses may be in the best position to adapt to climate change, lack of insurance coverage is a barrier.

Pro-vision Reef Response

Following the natural disasters in Queensland early in 2011 and following on from major cyclones over the past few years, insurance premiums have skyrocketed. Concern remains as to whether the degree of exposure to the natural disasters in Queensland is shared by the insurance companies or whether those with limited exposure, such as those that receive premium revenues from various parts of the world, are simply gouging the market. Either way, we would support an enquiry into the insurance industry as costs are spiralling. This is another by-product of climate change that will create a barrier to effective adaptation.

Businesses in the aquarium supply industry have substantial shore-based investment and most have many more staff employed on shore than are deployed at sea. Limiting insurance cover is viewed as false economy but the premiums contribute to the costs that inhibit competitiveness.

3.5. Regulation¹⁹

- What regulations reduce the flexibility of individuals, businesses and other organisations to adapt to the potential impacts of climate change?
- What reforms are needed to improve the efficiency of existing regulations? Are there alternative ways to achieve the desired objectives?
- Are any new regulations justified to facilitate adaptation? What would be the costs and benefits to the wider community?
- How have state and local governments responded to the potential impacts of climate change through their planning and zoning policies? Are there existing planning policies that could constrain the ability of individuals and businesses to adapt, or reduce their flexibility? What reforms may be needed to meet community objectives while facilitating effective adaptation – are there good examples?
- What implications might climate change have for local councils' planning policies and development approval processes? Has concern about legal liability restricted the ability of councils to achieve good economic, social or environmental outcomes?

¹⁹ Productivity Commission (2011, pp.17-19).

- How might building regulation affect the ability of individuals and businesses to adapt to climate change? Are there any inconsistencies across the States and Territories that could impede adaptation?
- What would be the costs and benefits of changing the way that the building code is applied across different geographic or climatic zones, or to establish new zones (for example, to allow for greater variation across regions)?
- How might regulation covering network infrastructure affect how infrastructure owners adapt to the impacts of climate change – for example, by discouraging investments in infrastructure upgrades or strategies that give them greater flexibility to adapt? What would be the costs and benefits of any changes to existing regulations?

QSIA Response

Progressive Australian governments have promoted variations in climate change legislation and regulation. Industry will need to clearly assess the impacts of climate change legislation along its supply chains. Depending on the impacts it is incumbent that both industry and government work collaboratively to provide assistance to industry to deal with changes brought on by the introduction of specific legislation.

Ideally the introduction of new legislation would involve consultation between industry and government. Clearly this is not always possible but given the target of the carbon tax legislation is 500 of the largest polluters the indirect impacts on other industries is a concern for commercial fishing peak bodies and their members. The carbon tax package has significant compensation measures for the community but it is clear that industry assistance is much lower.

A co-investment needs to be established between government and the Australian commercial fishing industry to start infrastructure investment funds to help industry recover from catastrophic weather events. Conduct an audit so as to identify key industry infrastructure. Ascertain the true economic value of this infrastructure in the supply chain and enter into appropriate funding models so that it is climate change ready and the integrity of 'the supply chain' is reinforced.

The ongoing development of ports along the Queensland coastline and the millions of tonnes of dredge spoil that is and will be produced is having and will have significant impacts on the marine ecosystem. The Queensland seafood sector is concerned with the response from government and the lack of leadership in the policy debate regarding coastal development where heavy industry (e.g. liquefied petroleum gas (LNG) and mining) has environmental impacts in the short and long-term versus the political driver of increasing employment and collection of significant mining royalties.

The ongoing development of the mining and LNG sectors in the State will also significantly increase bulk vessel movements along the Queensland coast. This increases the risk factor for a catastrophic maritime incident on the marine ecology in the Great Barrier Reef? Is the existing legislation sufficient protection for the World Heritage listed GBRMP or are greater regulatory controls required?

APFA Response

As stated previously there has been no new prawn farm development in Australia since 2002. The regulatory controls imposed do not meet the perceived risk. In fact intake water used by farms has to be returned to the environment cleaner due to imposed regulations

The Commission research paper for aquaculture in 2004 titled, '*Assessing Environmental Regulatory Arrangements for Aquaculture*' highlighted the following²⁰:

Aquaculture production is subject to an unnecessarily complex array of legislation and agencies - covering marine and coastal management, environmental management, land use planning, land tenure, native title and quarantine translocation.

Land based coastal management plans in Queensland for aquaculture has allocated areas but not in areas deemed useful for aquaculture development purposes. Regulation and government policies in general have impeded prawn farm industry development to the point where no new venture has been undertaken since 2002. The same rules do not seem to apply to the resource sector.

This impediment has had a flow on effect to the education sector and technical and further education institutes in Queensland have removed aquaculture from their curriculum. If students undergo training there is no new area they can work in. Prawn Farmers have recently supported an independent registered training organisation that has been able to source funding for existing workforce but no new comers are available for the industry which makes succession planning unachievable.

The recent push for sustainability In Australia, led by the retailers who claim it is consumer driven. APFA as a member of the Australian Seafood Cooperative Research Centre contributed communal funds for a robust omnibus consumer survey where consumer drivers to purchasing seafood were researched and found that sustainability didn't rank as a consumer choice.

Sustainability has been built into prawn farming from day one. Farmers are already responding to competitive market signals and climate extremes by edging closer to closed-cycle farming. But government has prematurely flipped the levers to full. Now zero net discharge of nutrients is being imposed on prawn farms up-front before this radical adaptation technology is even mature. This means that farms cannot grow and new farms cannot be built- leaving no opportunity to make any significant changes to farm infrastructure required by climate change?

An "effective" approach would have our farms follow competitive market signals, and grow larger and more profitable in a practical and of course a sustainable fashion. This in turn hedges against uncertainty and builds in resilience to absorb climate hits and dilutes the one-off costs of climate change adaptations into the grow-out production costs. Size brings with it flexibility too. It doesn't force businesses to follow a particular path. Staged growth is an opportunity for businesses to schedule any necessary modifications to intakes, ponds and infrastructure associated with adopting recirculation systems and ultimately for sea-level rise.

²⁰ Productivity Commission (2004).

Finally, the most effective adaptations to climate change are the ones that already make sense. Existing prawn farms are already adopting sustainable farming practices, domestication/selection, reducing reliance on fish meal, resisting cyclones and floods were always good ideas. There are few problems the industry faces that are purely climate change. That's why this young industry is already far along its climate-change 'to-do' list. Allowing the industry room to grow also makes sense- both economically and environmentally. If the barriers were removed the APFA believes that all government agencies will find that there will be no regrets.

This push for sustainable accreditation led by Australia's two largest retailer chains Woolworths and Coles has been highlighted as a major issue in the recently released Australian Food and Grocery Council - 2020: Industry at a crossroads report released early November 2011. Other key points raised in this report included:

- Unknown impacts of a carbon tax.
- Rising costs of wages, water and energy.
- The high Australian dollar making imports cheaper.
- Increasing Government regulation.

Of particular concern to prawn farmers was²¹, "Major retailers are also expected to continue 'parallel' of global brands where they believe the consumer does not perceive value or have affinity with locally produced'.

Pro-vision Reef Response

The adaptability of the fishing industry to permutations in critical market parameters, such as the foreign exchange rate, is constrained by regulation limiting access to fishing grounds and the ability to move seamlessly between fishing gear types and fisheries. This has rendered the industry much less robust to natural cycles of species abundance and is expected to further constrain industry viability when the frequency and extent of coral bleaching events and the increased scale of tropical cyclones manifests in further zoning of the Great Barrier Reef

The intent of these regulations is not argued but in reducing options to spread fishing effort and to diversify within the industry has increased the exposure of remaining businesses. In an industry that ebbs and flows with the seasons, a poor wet season that limits spawning success in estuaries and coastal wetlands no longer results in a poor season that can be absorbed by retaining diversified fishing interests. It often means finding other means of employment and not deploying assets upon which money is owed.

Diversification into other fisheries requires substantial investment that is often beyond the reach of small business operators, particularly since the global financial crisis. The variable weather conditions projected to accompany climate change will exacerbate this problem and it is expected that the all of the fishing industry will shrink as a result. Those that exit will likely be the owner operator, family business. This has substantial flow on effects throughout numerous coastal communities where alternate employment opportunities are few.

²¹ Australian Food and Grocery Council (2011, p.42).

3.6. Government Provision of Public Goods²²

- What government-provided goods and services might be significantly impacted by climate change? What decisions or trade-offs may have to be made - for example, about the balance between emergency response and preparedness, or the best way to protect natural environments when species may need to migrate?
- What kinds of information are already provided by governments to help individuals or businesses to understand risks? Is there a case for more government provision of climate-related information, or to disseminate this differently?
- To what extent do government infrastructure decisions draw on a 'real options' approach? Are there regulatory, institutional, governance or political barriers that may be discouraging such approaches?

QSIA Response

Governments at the State and Federal levels should understand that industry do not seek 'hand outs' post catastrophic weather events. Guidelines for applying for government assistance would provide greater short and medium-term assistance if the amounts that could be applied for are lowered - perhaps amounts between \$500-\$2,000 under existing assistance guidelines.

Better communication is a constant need; climate change research is often presented in very detailed terms. Information and data needs to be bundled in such a way as to meet the needs of specific audiences. The communication challenge is disseminating this through the wider membership. What resources are available to maximise this engagement, thereby substantially increasing the level of understanding required for individual businesses to be able to make informed decisions. Tailoring climate change messages to industry is a critical component of helping industry to adopt their businesses.

In terms of commercial seafood industry infrastructure the 'real options' approach is a non-issue. Since the impacts on commercial seafood infrastructure post Tropical Cyclone Yasi remain unrepaired. Industry cannot afford to replace infrastructure without the assistance of government.

Pro-vision Reef Response

Adaptation to climate change is a challenge for every part of the community. For small business, augmenting the capacity to manage change and the provision of tools to predict the financial implication of various scenarios would be welcome service assistance. There are a plethora of government funded small business assistance programs that can be accessed. As useful as these programs are, there are no programs that explicitly address change management in the context of climate change.

Such programs will equip participating businesses with the ability to measure through, for example, a cash flow predictive tool when various scenarios are modelled. These are not complicated to develop but are not readily available as a service delivered through government agencies.

²² Productivity Commission (2011, p.20).

Adaptive and flexible planning and management of resources and resource use is another key direction for government agencies involved in the fishing industry. I'm pleased to say that the agencies that oversee fisheries and marine protected areas on the Great Barrier Reef are moving in this direction.

3.7. Direct Assistance²³

- In what areas or sectors might structural pressures as a result of climate change be greatest? Are there any existing regulatory and policy barriers that might impede adjustment?
- Are current relief payments, such as those funded through the Natural Disaster Relief and Recovery Arrangements appropriate?

QSIA Response

The introduction of a carbon tax system under the Federal government's Clean Energy Future plan and structurally the commercial seafood sector will feel the impacts of increased energy and transportation costs. The AI Group notes:

Impacted businesses can pass on their costs to the extent that their competitors are in the same boat. So dry cleaners, restaurants, truckers, domestic airlines and other businesses not exposed to international trade will raise their prices, though less efficient operators will be at a disadvantage. However, many of the affected businesses compete against imports or in global export markets and have limited or no ability to pass through cost increases²⁴.

After the 2010/11 flood season in Queensland the commercial seafood sector was significantly impacted by the impact of Tropical Cyclone Yasi.

Whilst industry at large is welcoming of a recovery instrument through which a modicum of financial relief can be accessed, the universal feedback of Tropical Cyclone Yasi and flood impacted members is that the current relief payment frameworks are not cognisant of the magnitude and diversity of climatic impacts on the aquatic industries. This position is further compounded by the land based production focus of the eligibility criteria accompanying the financial assistance packages and the inappropriate interpretation of 'loss of income' as relates to aquatic operations. These two factors alone identify that the prescriptive nature of the eligibility criteria and the capped nature of the funding mechanisms are not appropriate for, or aware of, the direct assistance needs of impacted members of the aquatic industries²⁵.

The Natural Disaster Relief and Recovery Arrangements (NDRRA) are triggered at times of significant disaster when the relevant Minister/Premier makes the declaration. These arrangements then determine where and at what level any income support is provided and to whom. Its function is to provide assistance to help meet the costs of damage to property across the primary industries spectrum. In the case of commercial fishing and as was the case through Tropical Cyclone Yasi, there are no provisions to help the marine ecology recover and any subsequent impacts on fish stocks in a disaster/cyclone affected area.

²³ Productivity Commission (2011, p.21).

²⁴ AI Group (2011, p.2).

²⁵ Observation - Industry Recovery Officer Tropical Cyclone Yasi - Seafood and Aquaculture Industries.

The impact on the fishers is both direct; (1) loss of access and (2) damage to the environment leading to a lack of fishable stocks.

There are no provisions under NDRRA that will allow the seafood industry or government agencies to claim for compensation for the loss and damage to the marine ecology; our paddock. If cyclonic activity increases in severity over time and more marine systems are impacted government will need to consider factoring in payments for these impacts²⁶; see Tobin et al (2010).

Whilst a welcome, and heavily accessed relief payment scheme, the effectiveness of this instrument in meeting social objectives and helping people to adjust was diluted through business size and infrastructure levels not being recognised as a criteria to accessing grants exceeding the current maximum of \$25,000. This observation is especially relevant to the larger aquaculture operations in Queensland, many of whom measured their individual direct impact (loss) from recent climatic events in the millions of dollars.

Representative bodies are thankful that their membership have access to recovery relief payments and would welcome the opportunity to enter into discussion on how to maximise the social objectives, human adjustment targets and business recovery from said mechanisms now and into the future.

3.8. Level of Government Responsibility²⁷

- Are there significant overlaps or inconsistencies between the adaptation policies of different levels of government? If so, what are these and what problems might they cause for effective adaptation? Alternatively, where differences exist, are there good examples of cooperative arrangements that could be adopted more broadly?
- Is there a need to alter policy responsibilities (or clarify responsibilities) across the different levels of government in order to facilitate adaptation?
- What are the most appropriate governance arrangements for overseeing adaptation responses at the local level?

QSIA Response

Governments at all levels have directed funding to the agriculture sector to adapt to climate change but often miss the commercial seafood sector or fail to recognise it as a primary industry. Peak industry bodies across Australia such as the QSIA could be funded to help deliver climate change messages and take advantage of industry knowledge and the best way to engage with commercial operators.

Government responsibilities are clear to industry advocates based in peak bodies. Commercial fishers have very little idea how responsibilities are divided across government agencies. Constant communication and targeted funding from government to industry peak bodies will ensure the best use of limited resources

²⁶ The socio-economic impacts of Tropical Cyclone Hamish were significant. Tobin et al (2010) provide an uncomfortable insight into future impacts of cyclone activity on the commercial seafood sector. A presentation of the lessons learned post-Tropical Cyclone Hamish can be found here: <http://www.climatechangeifishing.com.au/australian-seafood-industry-and-climate-change-symposium-3-4-march-2011>

²⁷ Productivity Commission (2011, p.23).

APFA Response

The APFA has had only one farm seek new development since 2002. It is understood the Queensland state government process took seven years to approve, which was a frustrating process as several government agencies were required to stay involved., there is no 'one stop shop' for aquaculture despite pleas over the last ten years for an Aquaculture Act that may streamline approval processes not delay, frustrate and cause unnecessary financial costs.

The CSIRO have put together a Research summary entitled 'The environmental management of prawn farming in Queensland - worlds best practice' which lists 46 different research papers undertaken between 1995 - 2004 for prawn pond nutrient process, downstream impacts and environmental management options for ponds, pond discharge composition, treatment and environment management, receiving waters - assimilation and monitoring, synthesis and land based mapping. Despite all this rigorous peer reviewed research government agencies continue to regulate this industry as if it were the same as an overseas operation or akin to a sewerage treatment plant.

3.9. Setting Priorities for Reforms²⁸

- Are these criteria relevant for assessing reforms to reduce barriers to adaptation?
- Are there other considerations or criteria the Commission should take into account to assess the likely costs and benefits of reform options?
- What reform options might satisfy these criteria?

QSIA Response

The Commission noted the following criteria²⁹:

- Depth of reform - does the reform address a problem that causes a large distortion in the allocation of resources? The larger the distortion, the greater the benefits of reform.
- Breadth of reform - does the problem affect a large share of the community? The more widespread the benefits, the more likely the return from the reform will be higher.
- Cost of reform - the costs of reform can include the costs to government of developing and implementing a reform, and the costs to business and the community of dealing with the changes. The higher the costs of a reform, the greater the payoff necessary to warrant the investment.

The criteria do not cover the responsibility of government to help industries transition and across Australia those costs will be substantial; the key question would be what the cost of not helping industry adapt is?

The introduction of legislation (i.e. carbon tax) will have indirect impacts on industry. The seafood industry faces constant structural and legislative obstacles to growth in the form of changing fisheries legislation; the existence of State based marine park legislation; the

²⁸ Productivity Commission (2011, p.24).

²⁹ Productivity Commission (2011, pp.23-24).

introduction on national marine park legislation; and a high Australian dollar limiting exports³⁰. This scenario has led to decreasing fleet size, smaller areas to fish commercially and increasing pressure from recreational fishing effort (provide reasons to suggest that climate change adaptation may not be a priority for industry).

³⁰ In the Queensland context, the development of port infrastructure for the mining sector and port growth means that commercial fishers will continue to lose access and displace fishing effort.

4. Additional Issues

4.1. Level of Response

A key impediment to adaptation are the time scales involved in responding to potential climate change impacts. Industry, government and researchers must significantly integrate their response to the climate challenge if they intend for industries in the agricultural sector to remain viable. Responses need to take shape on the following scale:

- Regional responses taking into account unique local climate and ecological factors;
- Planning that integrates industry, researcher and management thinking;
- Increasing the climate literacy amongst industry champions; and
- Sharing adaptation knowledge will become more and more critical³¹.

Cobon and his colleagues demonstrate a significant and urgent need for action from a grazing industry perspective (Cobon et al, 2009). Taking a risk management approach is simple methodology that can, as information becomes available, grow in complexity as required.

4.2. Bridging the Information Divide

The extraordinary amount of climate change information, concept definitions and sources of information can lead to a sense of information overload. Adaptation as defined by the IPCC and UNDP suggest that action must come from those who are going to be impacted by climate change; governments will argue that this is a task for industry alone.

With the introduction of a carbon tax in Australia the Federal government has sent a strong signal to industry that the issue of climate change is a nationally significant one. All segments of the Australian economy will either directly or indirectly feel the impacts of a tax on carbon pollution. As a result, government at all levels cannot abrogate their responsibility to assist industries to adapt by way funding to develop easy to use / understand climate change information sheets that have industry and business level data.

OWA staff are involved in two Climate Change Adaptation research projects, *Climate Change Adaptation: A blueprint for coastal and regional communities* and *Climate Change Adaptation: Building community and industry knowledge*, both projects are funded via the Fisheries Research and Development Corporation's (FRDC) *Climate Change Adaptation fund*.

The first project, *Climate Change Adaptation: A blueprint for coastal and regional communities*, is an in-depth study of three coastal communities around Australia, and will be undertaken using methods developed to identify specific adaptation strategies for climate change impacts. OWA's SeaNet Officers will provide the knowledge brokering between industry communities and the researchers, as well as facilitating the engagement process. This is a two year research and extension project, which began in November 2011.

The second project, *Climate Change Adaptation: Building community and industry knowledge*, involves wide-scale delivery of outcomes and benefits to fishing communities in order to ensure the information reaches the main benefactors. As there is much confusion in coastal communities around climate change impacts and adaptation strategies, there is a

³¹ Cobon et al (2009); Howden et al (2007); Iglesias et al (2007).

need for the science to be presented as clear simple information. The confusion in the community between the climate variability verses climate change is compounded in fishing communities, as they are used to the environmental variability.

The purpose of this project is; a better and more informed understanding of the key climate-change issues, more flexible management and adaptation strategies considered, community engagement and involvement in managing that engagement, heightened awareness of adaptation options open to communities and government, closer linkages between the recreational, commercial and government sectors, and validated information being utilised to assist with decision making³².

This project will employ the SeaNet Extension Officers in 3 regions around Australia to support FRDC project 2010/542, 'A climate change adaptation blueprint for coastal regional communities'. The project will include support for 2 Postdoctoral fellows employed under project 542 as well as tasks associated with the extension and uptake of climate change science and adaptation in coastal fishing communities and industry. The project will be run out of the Western Australian Marine Science Institution in Perth over a 2 year period.

4.3. What Constitutes Good Adaptation

What does good climate change adaptation look like? A subjective but critical question facing government, industry and the research community. Does adaption at one point in time mean that a business can therefore stop engaging in evaluating their business practices in the face of change and in particular climate change?

Efforts have been directed to developing what constitutes adaptation. The Climate Change Adaptation Checklist developed by the Australian Industry Group (AI Group) and the Victorian Department of Sustainability and Environment provides a means to assess risk within the business. The checklist was developed to assist organisations to identify and assess climate change risks and adapt to the resultant challenges; the checklist includes³³:

- Step 1: Establish the context; key question - Are you aware of the projected direction and rate of change of key climatic variables in your region?
- Step 2: Identify the risks; key question - Have you identified climate change risks and considered the impacts these may have on your business?
- Step 3: Analyse the risks; key question - Have you assessed climate change risks?
- Step 4: Evaluate the risks; key question - Have the climate change risks been evaluated?
- Step 5: Treat the risks; key question - Have you proposed adaptation actions to treat the extreme and high risks?

This approach is similar to the one outlined by Cobon and his associates but unlike the specific industry examined (the grazing sector) a checklist with a set of generic questions may not reflect individual business differences.

4.4. Adaptation Options

A way to summarise what is needed by industry in terms of breaking barriers to adaptation can be found in work undertaken by Hobday and Poloczanska (2010, pp.211-212). The

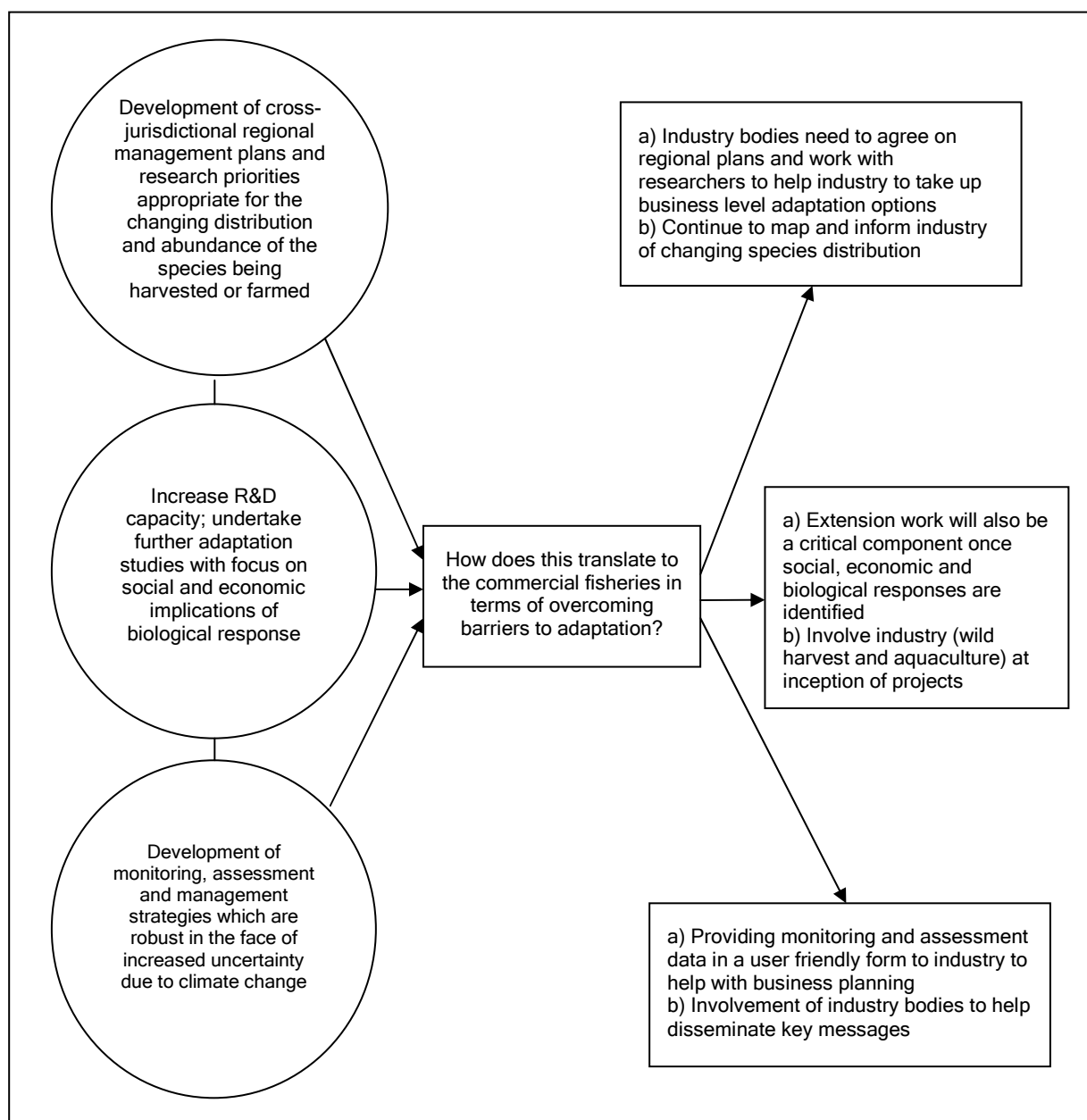
³² We hope to update the Commission as these research projects progress.

³³ AI Group and the Victorian Department of Sustainability and Environment (2011, pp.4-5).

authors refer to adaption options at the policy, climate information/use and Species Ecosystem issues. Hobday and Poloczanska (2010) also provide additional research priority areas, please refer to Appendix 1.

The priority areas noted Figure 3 have a strong research focus which is essential but it must be noted that long-term adaptation is better served by a continuing engagement between the research community and projects that have a demonstrable impact at the business level. If it is assumed that adaptation is an ongoing process all facets of industry need to be involved in championing adaptation.

Figure 3
Key Policy Level Adaptation Options³⁴



³⁴ Hobday and Poloczanska (2010, p.212).

Under the policy adaption options, Hobday and Poloczanska (2010, p.212) also note:

Encourage appropriate management, policy, and industry structures to enable flexibility in adapting to climate change while minimising maladaptation.

Encourage diversification of enterprises (e.g. ecotourism, scientific charters, recreational fishing) where practicable.

These policy level of intervention in some ways are more critical to breaking barriers to adaptation at the business level. Who is responsible for business level planning in the context of a changing climate? It is easy to say its a purely business level response. This is not the case and the need for a multi-level approach is now more critical with the legislative implications of a carbon tax on industry.

Again using Queensland fisheries as an example; how do you encourage an adaptation focus at the business level when government agencies such as the GBRMPA and Fisheries Queensland must manage the conservation and fisheries management components of a fishery and the QSIA manage the interaction between these groups and business at an industry level.

Rarely do the business level concerns receive enough focus or funding, that is, neither government or industry bodies can help individual operators to adapt. Table 3 provides an outline of a hypothetical funding source that could assist fishers at the business level.

Table 3
Funding Program Outline

Funding Body	Funding Recipient	Fund Tranche 1 \$340,000; 2-year project Business Level Climate Change Adaptation Project
DAFF	QSIA	<p>Year 1</p> <ul style="list-style-type: none"> 2 finance/business planning officers - \$70,000.00 per officer including superannuation = \$140,000.00 Travel budget - \$15,000.00 per officer = \$30,000.00 <p>Year 2</p> <ul style="list-style-type: none"> 2 finance/business planning officers - \$70,000.00 per officer including superannuation = \$140,000.00 Travel budget - \$15,000.00 per officer = \$30,000.00 <p>Tasks</p> <ul style="list-style-type: none"> Attend regional locations and / or key ports to assist individual fishers examine their business structure and suggest savings and planning options tailored to their business. Develop a database on key issue limiting business operations. Report findings to peak bodies to help develop Funding Tranche 2.

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Appendix 1

Adaptation Options	Priority
Climate information and use	
Improve resolution of climate models and couple with ecosystem models for biological predictions	1
Development of decision support tools to enable access to climate data and interpretation in relation to stakeholder goals and to analyse alternative management options	1
Ensure communication of broader climate change information	2
Species and ecosystem issues	
Undertake integrated regional case studies that inform the potential impact of climate change and the adaptation responses	1
Develop understanding of how robust current management strategies are in the face of uncertainty (fisheries)	1
Implement observational systems that can detect change or provide robust indicators for effect of adaptation approach	1
Improve predictive tools and indicators for species impacted by climate change, harvest modelling capabilities and quantitative approaches to risk management	2
Selective breeding of varieties with appropriate physical tolerances and phenological characteristics for changed environment (aquaculture)	2

Source: Derived from Table 13.3, p.212: Summary of climate change adaptation options for marine fisheries and aquaculture. Priority 1 (high), 2 (medium) and 3 (low). Options relevant to fisheries or aquaculture only are indicated.

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