Australian Government

Department of Climate Change, Energy, the Environment and Water

House Standing Committee on Climate Change, Energy, Environment and Water

Inquiry into the 2009 and 2013 amendments to the 1996 Protocol to the Convention on the Prevention of Marine Pollution by dumping of Wastes and Other Matter 1972 (London Protocol).

Submission

Date 24 March 2023

Table of Contents

Introduction

DCCEEW makes this submission in response to the Committee's Inquiry into the 2009 and 2013 amendments to the London Protocol. The submission considers the two amendments in relation to the Commonwealth environment regulatory regime (*Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act)) for managing impacts on the marine environment. Responses are provided for each of the following terms of reference.

a) The environmental benefits and impacts of exporting and importing CO_2 streams for the purpose of sub-seabed sequestration.

b) The environmental benefits and impacts of marine geoengineering activity, such as ocean fertilisation, for scientific research.

c) The international market for CO_2 streams.

d) The interaction of the proposed amendments with greenhouse gas inventories and regulatory and reporting systems.

Background

The London Protocol aims to protect and preserve the marine environment from all sources of pollution, and to prevent, reduce and, where practicable, eliminate pollution caused by dumping or incineration at sea of wastes or other matter. As of January 2023, there are 53 Contracting Parties to the London Protocol. Key decisions relevant to Australia's implementation of the London Protocol are as follows:

1981 The Sea Dumping Act implements Australia's obligations under the London Convention, and was later amended to take into account the London Protocol.

1996 Contracting Parties to the London Convention concluded negotiations on a free-standing treaty, the London Protocol, to update the London Convention.

2000 Australia signed the London Protocol in 1998 and ratified it in 2000.

2006 On 24 March 2006, the London Protocol entered into force, including for Australia, when the required minimum number of Parties had ratified.

2006 Amendment (LP1(1)) to allow Contracting Parties to sequester CO_2 in their jurisdiction (in force). Australia jointly led the proposal to add CO_2 to Annex 1 to the London Protocol.

2009 Amendment (LP.3(4)) to permit the export of CO_2 streams from a Contracting Party to another country for the purpose of sequestration into sub-seabed geological formations (not in force).

2013 Amendment (LP4.(8)) allows for the placement of matter into the sea for the purpose of legitimate scientific research in marine geoengineering activities (not in force).

2019 London Protocol allows for a 'provisional application' for Contracting Parties to implement the 2009 amendment before it comes into force.

2009 Amendment to the London Protocol

The 2009 amendment (LP.3(4)) permits the export of CO_2 streams from a Contracting Party to another country for the purpose of sequestration into sub-seabed geological formations as a climate change mitigation measure. This builds on the 2006 amendment (LP1(1)) which allows Contracting Parties to sequester CO_2 within their jurisdiction.

Progress towards ratifying the 2009 amendment

Two-thirds of the 53 Contracting Parties to the London Protocol must ratify the 2009 amendment before it comes into force (35 Contracting Parties). To date, ten Contracting Parties have ratified the amendment: Norway and the UK (the first in 2011), followed by the Netherlands, the Islamic Republic of Iran, Finland, Estonia, Sweden, Denmark and most recently, the Republic of Korea and Belgium (as of April 2022).

Australia's ratification is well progressed with the Joint Standing Committee on Treaties (JSCOT) agreeing[1] in 2020 that the amendment is a minor treaty action, and that binding treaty action may be taken. Two further steps are required to implement the amendment and complete ratification. The first is to amend the Sea Dumping Act and the second is to deposit an instrument of ratification with the IMO.

In 2019, the London Protocol agreed to a 'provisional application' to allow Contracting Parties to use the 2009 amendment before it comes into force. Only six of the above ten Contracting Parties that have ratified the amendment, have taken the necessary steps to enable them to commence export of CO_2 for sequestration by completing their domestic arrangements. These are Belgium, Denmark, Netherlands, Norway, Republic of Korea, and Sweden.

Some regional partners (Singapore, Republic of Korea and Japan), as well as Australian industry groups, and large multinationals companies, have expressed interest in exporting CO_2 to Australia. European Contracting Parties would also be able to export CO_2 to Australia should there be a commercial interest and should the Government, subject to any internal processes, allow the export of CO_2 to Australia.

To implement the 2009 London Protocol amendment, the Sea Dumping Act would need to be amended to allow permitting to accommodate CO_2 that has been imported for sub-seabed sequestration – the Sea Dumping Act already provides for assessment and permitting for sequestration of domestic CO_2 in Australian waters, in accordance with the London Protocol. Amending the Sea Dumping Act would provide a robust legislative framework (including application, assessment, approvals processes, and monitoring, and compliance mechanisms), for companies wanting to export CO_2 to Australia for sequestration into sub-seabed geological formations.

2013 Amendment to the London Protocol

Marine geoengineering activities are potential tools to counteract human induced climate change and its impacts. They are deliberate large-scale interventions to the marine environment to remove CO_2 from the atmosphere or to reflect solar radiation back to space to reduce warming. Due to their large scale, their potential impacts could be significant and would not be limited to areas within national boundaries.

[1] On 10 February 2020, the Joint Standing Committee on Treaties (JSCOT) agreed not to hold formal inquiries in relation to the 2009 and 2013 London Protocol amendments, and that binding treaty action may be taken.

The 2013 amendment (LP.4(8)) allows for the placement of matter into the sea for the purpose of legitimate scientific research into marine geoengineering activities (such as ocean fertilisation). The 2013 amendment also established an international regulatory framework for ocean fertilisation activities.

Upon ratification, and when the amendment comes into force, Australia would be required to regulate all marine geoengineering activities in a manner consistent with this framework. Australia would apply a precautionary approach to evaluating activities seeking to undertake legitimate marine geoengineering research for climate change mitigation.

The London Protocol is looking at both preventative and treatment marine geoengineering techniques to mitigate climate change. The two preventative measures to reflect incoming heat and radiation are:

- Microbubbles – injecting tiny bubbles into the ocean surface, or into sea foam, to increase sunlight reflectivity.
- Marine cloud brightening or seeding – injecting sea salt into cloud updrafts to reflect sunlight back into space.

The two treatment measures which remove CO_2 from the environment through absorption are:

- Ocean alkalinization – adding alkaline substance into seawater to enhance the ocean's natural carbon sink.
- Macroalgae cultivation – large scale growth of algae that convert dissolved CO_2 into organic carbon through photosynthesis.

Progress towards ratifying the 2013 amendment

As with the 2009 London Protocol amendment, a two-thirds majority of the 53 Contracting Parties must have ratified before the amendment comes into force. To date, only six countries have ratified this amendment: the United Kingdom, Finland, the Netherlands, Norway, Estonia, and Germany.

There is growing international interest in researching marine geoengineering activities with reports of other Contracting Parties being approached by research and industry groups looking at larger scale operations. The International Maritime Organization is encouraging more Contracting Parties to ratify, so that the amendment can come into force.

As with the 2009 amendment, Australia's ratification is well progressed. The next steps are to amend the Sea Dumping Act, followed by deposit an instrument of ratification with the IMO. This will ensure that Australia is ready to administer applications for this type of scientific research when the 2013 London Protocol amendment comes into force. Until then, research and industry groups cannot apply for a permit to undertake marine geoengineering research activities.

Responses to the terms of reference

The environmental benefits and impacts of exporting and importing carbon dioxide streams for the purpose of sub-seabed sequestration.

There are important benefits in establishing a global framework to regulate the international trade of CO_2 to enable countries to manage their CO_2 emissions. Carbon Capture and Sequestration (CCS) is recognised as having the potential to play a key role in decarbonising energy intensive industries and hard-to-abate sectors such as cement and chemical production. The Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) both recognise the role that CCS can play in emissions scenarios, with the aim of limiting global temperature rise to 1.5˚C or under 2˚C of pre-industrial levels. The possibility of international trade of CO_2 for the purpose of sub-seabed sequestration has received increasing attention because many countries do not have the capacity to permanently store CO_2 in territorial geological formations.

International climate change initiatives

The IPCC, IEA, and International Renewable Energy Agency (IRENA) recognise that a range of CO_2 removal technologies are required to meet global net zero emissions. Offshore CCS is part of a suite of decarbonation strategies and offers a viable storage solution to emissions reduction projects that capture CO_2.

Environmental impacts and risks of sequestering CCS offshore

Environmental impacts associated with offshore CCS are project specific, noting that impacts encompass not only the ongoing storage, but development associated with platforms, transmission lines, and other project infrastructure. The scientific evidence suggests that environmental risks of CCS are generally considered low once CO_2 streams have been captured and sequestered in sub-seabed geological formations, and within the control of existing regulatory processes, such as the Sea Dumping Act.

Risks include:

- Unintentional releases of CO2 streams into the environment during transport in ships and pipelines.
- Unintentional releases of CO2 streams into the environment from storage facilities.

Such risks could be realised via:

- Local impacts of leakage to the subsurface (e.g., via geological faults and fractures, or from well heads) which could adversely affect marine plants and animals, and ground water.
- Leakage to the atmosphere during stable atmospheric conditions which could lead to local high CO2 concentrations in the air, which could harm animals or people.
- Small seismic events, subsidence and displacement of formation fluids and aquifers during CO2 injection.

Environmental permits required for CCS

Following ratification of the 2009 amendment, a country, that is seeking to export CO_2 for sequestration within Australia's jurisdiction, would be required to meet a range of approval and license conditions[2], and would require permit/authorisation under the amended Sea Dumping Act and from the Director of National Parks if the activity is to take place in an Australian marine park. It is important to note that Australia's environmental permits are in addition to any obligations pertaining to customs and biosecurity requirements.

1. Sea Dumping Act

Environmental impacts will be assessed on a project and site-specific basis through the permit process. Applicants will be required to provide information supporting their proposals (including import requirements to obtain the source of the CO_2) and demonstrate robust environmental management of their activities. A sea dumping permit will impose conditions and monitoring to mitigate environmental impacts.

The available scientific evidence suggests environmental impacts and risks can be effectively mitigated and monitored through the existing Sea Dumping Act and related regulatory processes. The Sea Dumping Act requires an assessment of projects including an assessment of the following criteria:

- CCS site selection and an assessment of the environmental impact at selected sites.
- Assessment of the suitability of the CO_2 stream regarding contaminants.
- Assessment of the risk of leakage and appropriate response strategies.
- Requirements for long-term site monitoring and reporting.

Activities to export CO_2 (or for Australia to accept it as an import) for sequestration into sub seabed formations, will not be regulated until amendments to the Sea Dumping Act are passed, and Australia deposits both an instrument of ratification and a 'declaration of provisional application' to the IMO. Once these processes and subsequent policy, including agreements between countries to satisfy the London Protocol are complete, Australia would be able to process applications for both export and import.

2. Australian Marine Parks

In addition to Sea Dumping Act requirements, if an action to export, import or store CO_2, and other greenhouse gases is proposed to occur in an Australian Marine Park, authorisation will be required from the Director of National Parks. Actions includes the development and operation of associated infrastructure. These activities will be managed in accordance with the Australian Marine Parks Assessment and Authorisations Policy and are subject to an assessment of any impacts and risks to a specific marine park's values – categorised as natural, cultural, socio-economic, and historic. The activity must also be consistent with zone objectives for the zone(s) in which the activity will be conducted.

[2] Including, but not limited to: the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth) (OPGGS Act) and, to a lesser extent, the *Great Barrier Reef Marine Park Act 1975*.

The environmental benefits and impacts of marine geoengineering activity, such as ocean fertilisation, for scientific research

The environmental benefits and impacts of marine geoengineering activities (such as ocean fertilisation) are still being explored. However, the concept of increasing the incidence of phytoplankton to absorb CO_2 has been around since the mid-1980s. Research has increased in recent years, in recognition of the growing international interest in these activities as possible climate change mitigation measures.

Environmental permits required for marine geoengineering activities

Following ratification and entry into force of the 2013 London Protocol amendment, anyone wanting to undertake scientific research into marine geoengineering activities listed under the London Protocol, will require permit/authorisation under an amended Sea Dumping Act, as well as from the Director of National Parks (if the activity is to take place in an Australian marine park) and under the *Great Barrier Reef Marine Park Act 1975* where the activity is proposed within the Great Barrier Reef.

1. **Sea Dumping Act.**

   Under the Sea Dumping Act, permit applications are assessed for environmental impacts on a case-by-case and site-specific basis. Amending the Sea Dumping Act will ensure Australia is in a better position to determine the benefits and impacts of marine geoengineering techniques, as project applications will be subject to robust regulatory assessment procedures. We will also be able to build an inventory of risks, benefits and impacts that will inform further assessments of applications for legitimate scientific research into these activities, and contribute to international discussion and knowledge on these technologies.

2. **Australian Marine Parks**

   Similar to CCS activities under the 2009 amendment, any future Sea Dumping Act permit applications for marine geoengineering activities for scientific research in Australian Marine Parks, will also require authorisation by the Director of National Parks. An assessment will consider the impacts and risks of these activities on specific marine park values - natural, cultural, socio-economic, and historic and managed in accordance with the Australian Marine Parks Assessment and Authorisations Policy. The activity must also be consistent with zone objectives for the zone(s) in which the activity will be conducted.

3. **Great Barrier Reef Marine Park Act 1975**

   Any permit application under the Sea Dumping Act for marine geoengineering activities for scientific research in the Great Barrier Reef, will also need to be assessed under the *Great Barrier Reef Marine Park Act 1975* legislative framework. One of the 16 mandatory criteria includes the consideration of international agreements, including the London Protocol.

Example of current research: Great Barrier Reef marine cloud brightening

A current program of research into Marine Cloud Brightening (MCB) is being conducted in the Great Barrier Reef under the Reef Restoration and Adaptation Program. It includes investigations into the use of MCB technologies to shade and cool large areas of reef at risk of bleaching, by spraying microscopic saltwater droplets into clouds to make them more reflective of sunlight. Small-scale experiments have been conducted with MCB equipment prototypes and 3D mapping of sea-salt plumes, critically refining, and advancing best-practice techniques on the path to future large-scale MCB trials. See Attachment A for 'A summary of the benefits and impacts of the Australian research program into Marine Cloud Brightening for the Great Barrier Reef'.

The Reef Restoration and Adaptation Program is funded by investments from the Australian Government, research partners and the philanthropic sector. It is an ambitious undertaking that seeks to develop a suite of interventions to help the Great Barrier Reef resist, adapt to, and recover from climate change impacts. The program is underpinned by a ten-year Research and Development (R&D) Plan and is the world's largest effort to help a significant ecosystem survive climate change.

The international market for carbon dioxide streams

The international market for CO_2 sequestration in sub-seabed geological formations is growing. There is interest from regional partners (Singapore, Republic of Korea and Japan), as well as Australian industry groups and large multinationals, to export CO_2 to Australia for permanent geological storage in Commonwealth waters. As mentioned above, Australia already regulates offshore CO_2 sequestration for domestically sourced CO_2 streams through various legislation. Amendments to the Sea Dumping Act are required, so that Australia is ready to administer applications from companies wanting to export CO_2 from overseas, for sequestration into Australian sub-seabed geological formations.

Growing interest in the international market for CO_2 streams has been catalysed by ongoing developments in Norway's Northern Lights project.[3] The offshore Norwegian project is seeking to provide a service for the transportation, receipt, and permanent storage of CO_2 in a reservoir in the northern North Sea. In September 2022, Denmark and Belgium concluded an arrangement to enable the transport of CO_2 between countries for the purpose of permanent geological storage.

There are opportunities for Australia to play a role in this emerging market, supporting the broader Asia-Pacific region in creating an international offshore carbon storage industry. Three of the top five global CO_2 emitters are in the Asia-Pacific, and together accounted for over a third of global CO_2 emissions in 2019. Allowing the importation of CO_2 could provide an important pathway to supporting decarbonisation plans of our regional partners, supporting broader global efforts in reducing emissions, attracting industry and international investment in Australian CCS projects, and strengthening economic bilateral relationships with regional partners.

Following ratification of the 2009 amendment, Australia will need to consider several legal, economic, technical, and regulatory matters for importing or exporting CO_2 such as:

- Responsibilities around liability.

[3] https://norlights.com/

- Impact on emissions inventory reporting and Paris Agreement target compliance.
- Level of readiness of projects and countries to export CO_2.
- The source of CO_2 emissions.
- Regulatory capacity and readiness for monitoring and injection.
- London Protocol obligations under the Sea Dumping Act.
- The consistency of any activities and trade with the global effort to achieve the Paris Agreement temperature goals.
- The capacity of partner countries to accurately monitor the emissions impact of participating in such trade and monitor for any leakage.

The interaction of the proposed amendments with greenhouse gas inventories and regulatory and reporting systems

There will be a direct association between the London Protocol amendments once they are in force, and greenhouse gas inventories and regulatory and reporting systems. Australia has obligations, as a Party, to several international treaties and agreements.

The UN climate treaties' emissions estimation and reporting requirements already accommodate transborder CCS activity. However, Australia's domestic facility-level emissions regulatory scheme could accommodate such activity with some amendments.

The United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement establish rules and guidelines for the measurement, reporting and verification of national greenhouse gas emissions. These treaties have near universal membership -198 Parties to the Convention and 194 Parties to the Paris Agreement.

The UNFCCC and the Paris Agreement require a Party to report in its national greenhouse gas inventory submission, the amounts of CO_2 that it imports and exports for the purposes of CCS, along with any emissions from leaks and vents occurring in its jurisdiction. Abatement is considered to occur at the point of capture of CO_2 for CCS. As a result, the reduction in emissions is reported by the Party where capture occurs, and any subsequent leaks or vents during transport, injection, and storage, are accounted for as a new emissions source in the country in which they occur.

Under the Paris Agreement, countries must submit this information at least every two years, with exceptions for least developed country Parties and small island developed States. The information is subject to technical review by a team of experts assembled by the UNFCCC secretariat, as well as a multilateral consideration process.

Australia's National Greenhouse and Energy Reporting (NGER) scheme is one of the most comprehensive mandatory facility level reporting systems for greenhouse gas emissions in the world. NGER scheme data reporting requirements, including emission estimation methods, align with the rules and guidelines adopted under the UN climate treaties, including IPCC emission estimation guidelines. NGER data is a key input into Australia's national inventory, enabling changes in emissions at the facility level to be reflected in our national inventory.

The NGER scheme currently captures information associated with domestic CCS projects in Australia, with information on the capture, transport, injection, and storage of CO_2 that occur within Australia - including any subsequent leaks or vents. The scheme's legislation will require technical amendments to capture reporting of the amounts of CO_2 imported or captured for export.

Australia would need to account for any releases of CO_2 that occurred within its jurisdiction during the sequestering process (including transport, injection or in long-term storage) in Australia's National Greenhouse Accounts (NGA). The NGA tracks Australia's progress towards its Paris Agreement target to achieve net zero emissions by 2050, meaning that any additional emissions resulting from sequestration would require further emission reduction elsewhere in the economy.

Amendments to the Sea Dumping Act

Australia's agreement to the 2009 and 2013 amendments to the London Protocol involves two steps. The first is to pass amendments to the Sea Dumping Act, and the next is to deposit an instrument of ratification for each amendment, and a declaration of provisional application for the 2009 amendment at the International Maritime Organization.

If passed, the amendments to the Sea Dumping Act would have the following outcomes for Australia:

- Enable assessment and granting of permits to export CO_2 streams from CCS processes for sequestration into sub-seabed geological formations, in accordance with the 2009 amendment.
- Allow for assessment and granting of permits for placement of wastes or other matter, for legitimate marine geoengineering research activities - in future, once the 2013 amendment enters into force.
- Support implementation of a robust application, assessment, approval, monitoring and compliance process for the two new permit categories.
- Ensure that industry has a strong level of confidence for undertaking these activities through agreed legal processes that are professionally managed. This would provide legal certainty for business and organisations, while protecting the marine environment from the potential impacts of these activities.

If the Sea Dumping Act is amended, Australia will need to deposit a declaration of provisional application to the IMO, before it may begin assessing and potentially permitting the export of CO_2 for sequestration into sub-seabed geological formations.

There is no provisional application capacity for the 2013 amendment. The IMO, through the London Protocol, is considering work to encourage more Contracting Parties to ratify this amendment, including gauging interest in proposing provisional application arrangements.

Australia will be well placed to administer permits when the 2013 amendment comes into force.

Conclusion

There are potential benefits and risks to be realised through the international movement of CO_2 for sub-seabed sequestration and further research into, and information sharing on, effective marine geoengineering techniques. The Australian Government has the capability to regulate CCS proposals from other countries wanting to export CO_2 for sub-seabed sequestration in Australia and proposals for Australia to export CO_2. Australia also has the capability to regulate proposals for legitimate scientific research into marine geoengineering activities.

Amending the Sea Dumping Act will meet Australia's obligations under the London Protocol to support ratification of the 2009 and 2013 amendments. It will also protect and preserve the marine environment from potential impacts through a robust science based regulatory framework.

Attachment A

A summary of benefits and impacts of the Australian research program into Marine Cloud Brightening for the Great Barrier Reef

Dr Daniel Harrison, Scientific Lead, RRAP Cooling and Shading Sub-Project, Southern Cross University, 3 February 2023

Marine Cloud Brightening (MCB) technologies aim to shade and cool large areas of reef at risk of bleaching, by spraying microscopic saltwater droplets into clouds to make them more reflective of sunlight.

Benefits

Regional scale cloud brightening is unique as a potential management tool for the Great Barrier Reef Marine Park. It offers an opportunity to protect the existing biodiversity and ecological functioning of the Great Barrier Reef (GBR), to the scale of the entire ecosystem (~320,000 km^2). Environmental modelling indicates GBR-scale solar radiation management has the potential to relieve coral bleaching stress by 50-70% over vast portions of the GBR during marine heat waves, assuming that technology can be developed to scale (Harrison et al. 2019). Ecological modelling looking forward over the next 50 years predicts vastly improved ecological outcomes for the Reef under a future climate consistent with meeting the goals of the Paris Agreement (RCP 2.6; Antony et al. 2019).

Risks

While the potential benefit could support maintaining a fully functioning reef ecosystem into the future, the risks of full-scale implementation also need to be considered. This is true both in technical capacity to achieve impact at scale for an acceptable cost (project technical risk), as well as social, regulatory, and environmental risks. As this is a first-in-world project, the modelling that was undertaken relies on assumptions to inform the estimates of potential efficacy as well as assess environmental risk. These assumptions can only be refined by a research and development (R&D) program of real-world outdoor scientific experimentation. Many of the considerations which apply to geoengineering, such as potential for major transboundary alteration of weather patterns, are expected to be low risk for an intermittent, localised intervention such as cloud brightening over the GBR. However, other environmental risks, such as short-term local changes in rainfall patterns need to be considered and are being investigated in the research program.

The RRAP Research and Development project

The Australian cloud brightening research program is a concerted effort that addresses the technical development requirements and practical feasibility of regional scale MCB implementation, while also deeply engaging in the regulatory, and social acceptability aspects. The main tenets of the (R&D) program are:

- Comprehensive characterisation and monitoring of aerosol – cloud – radiation processes over the Great Barrier Reef. This work addresses a significant knowledge gap in understanding atmospheric, meteorological, and cloud processes relevant to coral bleaching events on the GBR.

- Development of atmospheric and meteorological modelling tools that accurately depict these processes over the reef and will allow investigation of potential benefits and impacts of various deployment strategies. This aspect will also contribute to improving predictive capacity of climate modelling in this region, which is heavily understudied and was previously data poor.

- Development of the underlying technology for Marine Cloud Brightening. The Australian project is the first to progress underlying technology sufficiently into research to facilitate real-world outdoor studies. Although the program is now reaching the stage of testing the effects on cloud microphysical properties, considerable further effort in improvement and optimisation is required in underlying spraying technologies before implementation could be feasible.

- Conducting outdoor studies to collect real-world data on the performance of technology elements, the dispersion and fate of the atomised seawater, and the response of cloud microphysical properties to perturbation. This work underpins the validation of modelling as well as contributes to resolving fundamental scientific unknowns in aerosol (cloud) radiative processes which remain the largest uncertainty in global models to predict future climates.

- Engagement with community, stakeholders, and Traditional Owners of the Reef. Consent was sought from Traditional Owners with historical links to Sea Country where experiments take place and Traditional Owners have participated in all field campaigns undertaken by the program. Research is undertaken into the social acceptability of both scientific research and potential implementation, as well as Reef governance and legal structures.

Governance

This research is undertaken within the governance framework of RRAP which incorporates a risk review panel independent of the project team, scientific steering committee, and governance board. On-Reef outdoor experimentation is undertaken within the legislative framework of the *Great Barrier Reef Marine Park Act 1975*.