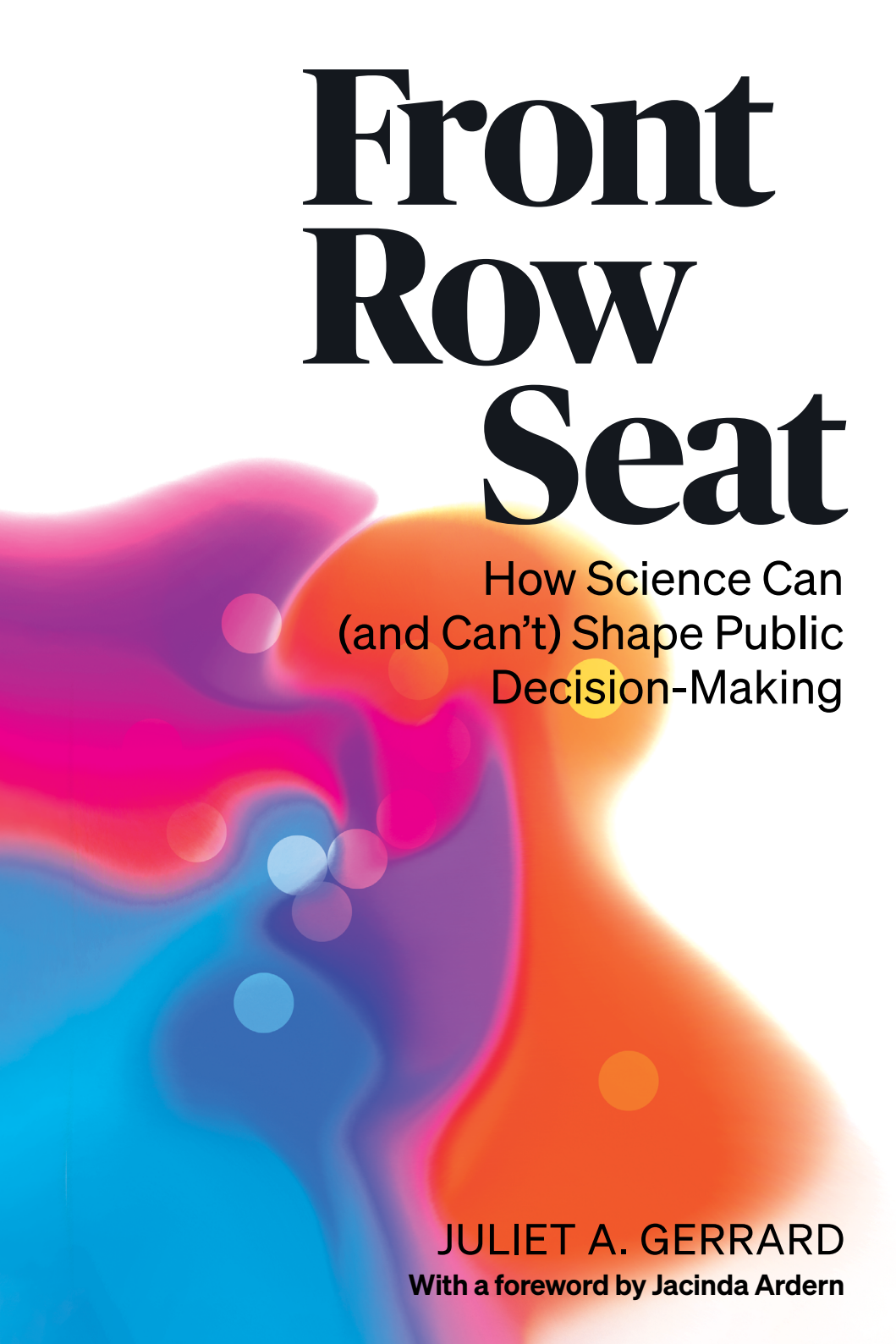




Front Row Seat

How Science Can
(and Can't) Shape Public
Decision-Making

JULIET A. GERRARD

With a foreword by Jacinda Ardern

'This vast collection of case studies and first-hand experience shows that the power of science and evidence is not only found in a lab, or behind a university lectern, but has a central role to play in politics, business, community work, or any other field that calls for problem solving. It also brings you inside the mind of one of New Zealand's most intelligent, committed, and thoughtful scientists.'

DAME JACINDA ARDERN, FROM THE FOREWORD

'Juliet Gerrard's *Front Row Seat* offers a comprehensive look at what was a very challenging period for New Zealand, one in which science advice played a crucial role. It is to Gerrard's credit that the more exceptional events (a terrorist attack, an eruption, a pandemic) don't dominate the book. Indeed, she offers a wide range of case studies, and in doing so, traverses almost all the terrain a science advisor could be expected to encounter. I found the text very readable . . . Gerrard's warmth and sense of humour also come through strongly.'

PROFESSOR SHAUN HENDY

'For six momentous years, Dame Juliet Gerrard provided a vital bridge, linking the worlds of science and policy at the highest levels of government. Drawing on this unique experience, together with her deep scientific expertise and practical wisdom, *Front Row Seat* explores the challenge of harnessing robust evidence to improve decision-making and protect the public interest. In this disturbing era of populist mantras, industrial-scale misinformation, and post-truth politics, her book provides a sober, perceptive, inspiring, and highly accessible corrective.'

PROFESSOR JONATHAN BOSTON

'*Front Row Seat* is a masterclass in the practical application of evidence-based policymaking, bridging the gap between academia and the high-stakes reality of governance. Dame Juliet Gerrard offers a rare, behind-the-scenes look at how science navigates the world of politics. Part memoir and part manual, this book is an essential resource for leaders, researchers, and anyone looking to understand how science advice can help solve the most varied and complex challenges of our time. It is a timely reminder that the most effective decisions in science diplomacy are not made in isolation but are built on a foundation of rigorous evidence and collaborative expertise.'

DR JAN LÜDERT

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To everyone who helped
– thank you

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Foreword

RT HON DAME JACINDA ARDERN
FORMER PRIME MINISTER OF NEW ZEALAND, 2017–2023

If you had asked me about the role of the Chief Science Advisor at the beginning of my time as Prime Minister, I imagine I would have given a fairly pro forma response. I believe strongly in evidence-based policymaking, but I couldn't have imagined just how important the role of science would become.

In this book, Professor Dame Juliet Gerrard asks the question 'How can science help?' And my answer after five years in office, multiple crises, and tricky policy decisions is that science has a role to play in almost every possible scenario you can imagine.

A terror attack, a volcanic eruption, a pandemic – each was unique in its challenges, but in each, there was an essential role for science and evidence. And an essential role for Dr Juliet Gerrard.

In her time as Chief Science Advisor, Juliet actively looked for opportunities to bring research, experts, and analytical devices to the many and varied challenges of government. Now in this book, she has concisely and clearly brought those same insights together in an account, and manual, for scientists, policymakers, politicians, leaders, and all those who just want to think differently about decision-making.

This vast collection of case studies and first-hand experience shows that the power of science and evidence is not only found in a lab, or behind a university lectern, but also has a central role to play in politics, business, community work, or any other field that calls for problem solving. It also brings you inside the mind of one of New Zealand's most intelligent, committed, and thoughtful scientists.

This book reinforces an important principle we should never take for granted: the more information we have available to us, and the greater the quality of it, the better the decision.

I cannot think of a more timely message or a better messenger.

Preface

‘No Caller ID’ is never an attractive banner on a ringing phone, so when it appeared on my screen, while I was driving one afternoon in 2018, my first instinct was to ignore it. On the second ring, I remembered that I was due a call from the bank and reluctantly pulled over and answered. It was not the bank, but what I initially assumed to be a prank caller, claiming to be from the Department of the Prime Minister and Cabinet. I was being invited to interview for the role of Prime Minister’s Chief Science Advisor.

I was aware that the role was becoming vacant, but not that I was being seriously considered, and was busy establishing myself in a new city following a relatively recent move to Waipapa Taumata Rau, University of Auckland. Politics had never been my thing, and my research was in no way policy facing; working for the Prime Minister was not on my radar. So I was perhaps a little abrupt in my response, to say the least, but my interest piqued as the conversation progressed. At the end of the call, I resumed driving to see a friend who had just had a baby, and after admiring her newborn daughter, shared the ‘weird phone call’ with her, still not entirely reassured that it wasn’t a joke. Her reaction was an emphatic ‘Do it’ and, having slept on it, I returned the call in the morning and said yes, I was interested to proceed to interview.

The interview was in a couple of weeks, and I had a lot of urgent thinking to do about how I might approach the role. There had been only one Prime Minister’s Chief Science Advisor in New Zealand, and I was keen to understand multiple perspectives, so was fortunate to connect with two experienced former Chief Science Advisors overseas, who were incredibly generous with their time and wisdom, and talked me through different ways to approach both the interview and the job. Importantly, they had both enjoyed their experiences enormously and they encouraged me to dive in. I remain hugely grateful for their insights and encouragement.

I had a few things in my favour. I’d just finished a stint as Chair of the Marsden Council, New Zealand’s research fund for fundamental sciences, which included the privilege of sitting in on all the panel meetings to allocate funding across the entire research spectrum. This gave me a strong, multidisciplinary network and a solid handle on the very different ways in which research was done in different fields. I also had a mentor or two who tested my appetite

for the job and helped me prepare. Finally, although the role is not a political one, the change of government meant that an entirely fresh face was not necessarily a disadvantage; so perhaps I was in the right place at the right time.

The process was in two stages. The long-listed candidates undertook a rather gruelling interview with senior officials, which included, somewhat presciently as it turned out, a scenario probing how I might approach advice on a volcanic eruption. As a bio-chemist, this was a stretch, and I confess to having had an inner ‘Bridget Jones moment’ as I answered. Two short-listed candidates then met with the Prime Minister one-on-one: a so-called ‘chemistry check’. I enjoyed this surprisingly relaxed meeting in the Prime Minister’s office, discussing what sort of advice she might need and which ways of working might work best. I left the Beehive¹ grateful for the experience, but with low expectations, and when I received the call to say I was the preferred candidate, my reaction was evenly split between excitement and terror.

I had a few short weeks to prepare, and received fantastic support from the University of Auckland to establish an office ahead of a contract being in place. A quirk of the role was that it was a fixed-term secondment, and the small number of staff did not automatically roll over with the changing of the guard. There was an extraordinary amount to learn and a great deal to do but, as I girded my loins, I had huge support from both the research community, upon whom the role relies, and my counterparts internationally, who shared their experiences. And I was fortunate that I was quickly able to hire a trusted colleague as an advisor, and a miraculous executive assistant, who appeared from the temp agency like Mary Poppins and made everything happen.

I was in at the deep end. The next six years turned out to be ones in which science, in its broadest sense, played an unusually high-profile role. Alongside the long-term commissioned work that we undertook on strategic issues, there were three very different crises in which we were asked for support: the Christchurch mosque shooting, the volcanic eruption on Whakaari/White Island, and the all-consuming pandemic. It was, without doubt, the most challenging and most rewarding period of my career, and I am very glad that I picked up that ‘No Caller ID’ call in 2018.

This book aims to tell an ‘inside story’ of some of the projects that we worked on over the six tumultuous years, and to distil from these some of the things that I learned and that I wish I had known at the beginning. I hope it provides useful insights for those seeking to understand how science advice works, or doesn’t, within the political sphere and serves as a guide for any researcher who seeks to influence policy, or any policymaker seeking evidence to inform their work, anywhere in the messy and unpredictable world of politics.

When Are Hearts and Minds Open to Evidence?

Moving Beyond Social Licence

CHAPTER TWO

Two of our early projects addressed big, gnarly problems that would require a systems change to solve them – the first on plastics pollution,¹ and the second on the future of commercial fisheries.² Plastics was a subject that was on the minds of the public, researchers, policymakers, and politicians and an obvious topic for an evidence synthesis. Commercial fishing was a subject chosen by the Prime Minister, prompted by the confusing and conflicting data that were available on the topic. Despite their similarities, the two projects took very different trajectories, emphasising the need to understand the degree of consensus on an issue ahead of providing technical advice.

Case Study 1: Rethinking plastics

The day before I began my role as the Prime Minister's Chief Science Advisor, I was interviewed on national television.³ The interviewer was keen to understand my planned work programme, and I was keen to explain that I didn't have a personal shopping list of pet projects in my handbag. Rather, I planned to spend some time listening: to the experience of the Chief Science Advisors in different ministries, departments, and agencies; to policymakers to understand the policy agenda and where within that agenda advice was most needed; and to researchers around the country who had ideas about where the evidence base could be better used to inform policy. Pushed for examples, I mentioned waste management as an issue where an evidence base might inform advances in New Zealand.

The Prime Minister's parental leave afforded me a fortuitous six-week window during which to do some listening, and researchers around the country were particularly enthusiastic to engage in the conversation. I travelled around the country having as many conversations as I could, with as wide a range of perspectives as possible, prioritising those who approached me with passionate views, many of whom had not always felt heard. These conversations formed the basis of both my initial work programme and a relationship network that provided enormous value throughout my six years in the role. Some conversations were in small groups or with individuals, others in larger forums. To canvas as many views as possible, I travelled with a biscuit tin full of Post-it notes, and asked people to jot down their ideas and fill the tin as they left.

Back in the office, as I established my small team,⁴ the Post-it notes began to adorn the wall, organised by topic, and our many visitors enthusiastically added to the burgeoning collection of ideas.⁵ 'Alternatives to plastic' stood out as a topic where much could be gained at the evidence-policy interface in New Zealand. There was high public awareness of this topic too, particularly the problems that plastic was causing in the ocean;⁶ grass roots movements such as 'Plastic Free July' were gaining strength;⁷ and the Colmar Brunton Better Futures Report 2018 highlighted plastic waste in the environment as a headline issue for 72 per cent of New Zealanders.⁸

In my first formal meeting with the Prime Minister, we discussed my work programme, and it became apparent that this topic also resonated with both political priorities and the policy agenda. The Prime Minister had a personal interest in the topic too, prompted in part by letters from children asking her to address the issue. The Government of the day included ministers from the Green Party, including the Minister holding the relevant delegation in the Environment Portfolio, who was passionate on the topic of waste minimisation. The policy agenda therefore already included plastic waste, and policy officials from the Ministry for the Environment were receptive to our proposal to synthesise the evidence base to support their work. So, with what felt like following winds, our first major project, Rethinking Plastics in Aotearoa New Zealand, was commissioned by the Prime Minister.⁹

Committed to our RITA principles (→CHPT.1), we began by putting out an open call for those interested in working on the project, as we crafted a draft terms of reference to be finalised after expert input. We were swamped with enthusiasm and spoiled for choice on who to appoint to our expert panel. Not wanting to lose the wider expertise of those who couldn't fit onto the panel, we also established a large reference group which would have access to the draft report and provide input and peer review on topics on which they had expertise. This fantastic group included researchers across disciplines, policy experts, business, and non-governmental organisations (NGOs) who made an enormous difference to the quality of the final report. Having a wider reference group was something we adopted, with modification, for all our major projects, to bolster our inclusivity, transparency, and accessibility. It also created a very large workload for what was, especially at the time we were doing the rethinking plastics project, a very small team.¹⁰

After some initial hesitancy and a robust exchange or two in which I welcomed all views on plastics to inform the project, we were lucky to have very constructive engagement from different parts of the plastics industry in New Zealand. A huge range of stakeholders acknowledged that there was a problem to solve and that we could do better, as a society, in our use of plastic. Our expert panel and writing team engaged with many different individuals and organisations, gained insights from the academic and grey literature¹¹ and drew on experience overseas. The final report was

peppered with case studies, with concrete examples showcasing best practice and capturing the excitement of community initiatives. One of these featured Pare Kore, a not-for-profit Māori organisation that aims to reduce waste and restore connections with Papatūānuku,¹² which highlighted beautifully how well some of our recommendations resonated with wisdom from the Māori world.

The tag line for the report became ‘Make best practice standard practice’, a lesson that proved useful for much of the work we did to address ‘wicked problems’,¹³ where a system change is needed to move the dial. Action is often led by community organisations, and guidance for making best practice standard practice is increasingly shared between them,¹⁴ so we invested some effort in making the case studies readily accessible on our website for those who didn’t want to read the full report.¹⁵

Like many of our later projects, the plastics problem is big enough for multiple solutions. We cannot recycle our way out of the problem,¹⁶ but recycling is part of a systems change that also includes: a national action plan; a move to enable consistency in design, use, and disposal; innovation and amplification of existing solutions; and urgent mitigation of the environmental and health impacts of plastic – all underpinned by the need for better data collection.¹⁷

The plastic-free movement is a good example of how empowering citizens can bring about positive change,¹⁸ and we were conscious that a ‘finger-wagging’ list of things that people were doing wrong was unlikely to create the system shift we needed. Evidence suggests that a positively framed narrative, focused on the solution not the problem, is more likely to be welcomed.¹⁹ So we included a little creative writing in the form of a vision for how New Zealand could look if we implemented all the changes. To the expert panel’s delight, the vision got a warm response, including from the Ministry for the Environment, who endorsed our work with an enthusiastic tweet: ‘If you read nothing else today, make it this. A vision for Aotearoa [New Zealand] in 2030 – where we have completely changed our relationship with plastics’;²⁰ and the report was waved in Parliament by the Minister, who especially drew members’ attention to the case studies for their summer reading. Our positive framing was paying off.

Underpinning the vision, we also made a series of detailed recommendations, which had been requested by the Prime Minister and officials and were welcomed by those making policy in the Ministry for the Environment, with whom we shared our progress throughout [→CHPT.1/INCLUSIVITY] and took some feedback as to how to make the recommendations practical to implement. We resisted requests to rank the recommendations (which seemed to call for value judgements outside the scope of science advice [→CHPT.9/QUESTION 13]) but we did include timeframes for each set, to scaffold a logical, internally consistent road map for system change.

Not everyone wants to read a thesis-length document, so we also provided a quick summary report, and for those pressed for time, and the many who were to gather to launch the report, a two-page flier capturing the key messages [→CHPT.1/ACCESSIBILITY]. We were fortunate that Shirley Horrocks, an independent filmmaker, was working alongside us to make short documentaries on some of our work, and captured the plastics project as a short film,²¹ which was launched by the Governor-General shortly after the report was released.

One of the poster children in our report was the work of Sustainable Coastlines,²² who had understood early on that beach clean-ups could be harnessed to create data to drive policy change. Working with the Ministry for the Environment and Statistics New Zealand, they pioneered methodology in New Zealand to demonstrate which plastics were appearing on which beaches, and how these changed as policies shifted.²³ We had been delighted to collaborate with them during the project, and were thrilled when they agreed to host our launch on the Auckland waterfront.

Looking back, the launch of Rethinking Plastics in Aotearoa New Zealand was one of the clear highlights of my six years in the role. The sun was shining, we had a Prime Minister and a minister launching our report, and a swag of journalists were in attendance. An initial announcement of changes that had been swiftly agreed and implemented was made on the day (helped hugely by our collaborative relationship with the Ministry for the Environment). These generated widespread media coverage including front-page headlines such as 'Drastic Plastic Ban'.²⁴ The media were struggling to find negative commentary; a highlight for me was watching an industry representative take a call from a journalist to provide their

perspective and saying ‘Yes, but I’m standing a few feet away from you, so no need for the phone.’ RITA had served us well.

I had imagined this December event to be the last big one of the year, but events overtook us shortly afterwards with the eruption of Whakaari/White Island [→CHPT.3/CASE STUDY 4] and the pandemic [→CHPT.3/CASE STUDY 5]. So we were especially pleased to see that our recommendations stayed on the policy agenda and featured in the speech from the throne in 2020.²⁵ Researchers spend a lot of time analysing where their research is cited and, by the metrics researchers are taught to use, this citation would count for little, but it remains one of my most prized:

The Government will implement the recommendations of the Prime Minister’s Chief Science Advisor by phasing out hard to recycle single-use plastic items and supporting the development of alternatives through a Plastics Innovation Fund (from Dame Patsy Reddy’s Speech from the Throne).²⁶

After a formal response to the report,²⁷ policymakers continued to use our evidence base to support their agenda for change, and, importantly, the focus shifted squarely onto these policies, not our report. Embedding evidence into policy means letting others take ownership of the case for change and making it happen. In this case, the push for change involved many officials in central and local government, who were experts in this topic way ahead of our report being commissioned. So, it was welcome that our report dropped out of the headlines and commentary as the next steps in a policy programme were announced, appearing just as a link on the website for those seeking the detailed evidence.²⁸ Indeed, our reports seemed more likely to linger in the media when they were ignored [→CHPT.4/CASE STUDY 9].

Although the pace slowed as Prime Ministers changed and government priorities inevitably shifted,²⁹ the direction of travel was hopefully now embedded. This was not too surprising, since opposition spokespeople had in general been supportive when we briefed them on waste management – it is hard to argue *for* a mountain of plastic waste in the ocean. Of course, we could always do more, and we can always go faster (and, if I am honest, I am still a bit miffed that recommendation 4d was put on hold),³⁰ but changes continued to be rolled out across three governments,³¹

which later case studies will show is, sadly, unusual. In general, the global call for change has only strengthened in the time since the report was written. Popular books continue to be written on the topic from a variety of perspectives,³² and an abundance of reports appeared during or after our project.³³ All reach pretty much the same conclusion.

The rethinking plastics report emphasises that the problem is a global one, but one that needs both local and global solutions. The Ministry of Foreign Affairs and Trade had an interest in sharing our thinking internationally, and I was privileged to attend the ASEAN Indo-Pacific Workshop on Marine Plastic Debris in Indonesia in 2023 and the Rapa Nui Pacific Leaders' Summit in 2024 to present our findings. It was clear at both meetings that the growing consensus we had found in New Zealand was shared in many parts of the world, especially in the island nations of the Pacific that receive a grossly disproportionate share of marine plastic debris on their shores.³⁴ This debris continues to break down to micro- and nanoplastics, with growing concern about the impact of these particles on human health.³⁵ This global concern is reflected in the United Nations' continuing efforts to pursue a meaningful, legally binding Global Plastics Treaty.³⁶

Case Study 2: The future of commercial fishing in Aotearoa New Zealand

Shortly after our rethinking plastics project concluded, a wise government official congratulated me on how it had landed. As an afterthought, and with a twinkle in his eye, he added, 'That won't happen every time, you know.' These words rang loudly in my ears throughout our next project.

'The Future of Commercial Fishing in Aotearoa New Zealand' was a stark contrast to the earlier project: this time we had serious headwinds. In part, this was due to the project being rudely interrupted by the pandemic, meaning that in-person engagement was only intermittent. Mostly, though, the challenges arose from the nature of the topic itself, and those who had an interest in it – a community that I quickly learned was riddled with decades-old feuds and deep conflicts. One official told me that, for certain meetings discussing commercial fishing quotas, they used to sneak in a blood pressure monitor to see who could record the highest

reading. Early in the project, I assumed this was said in jest, but by the end I was much less sure. Without a doubt, this was the hardest project we did.

Unlike plastics, commercial fishing was not on the list of suggested projects that I had sent to the Prime Minister ahead of our meeting to discuss the next major piece of work. Rather, the day before our scheduled meeting, I bumped into her in the Beehive as I was showing my new Principal Advisor around. ‘Just a heads up for tomorrow,’ she said hastily as our paths crossed. ‘Have a think about fish.’ After squeezing in a few quick meetings and phone calls with other Chief Science Advisors to work out who else might or might not be thinking about fish, and why, I went to my regular catch-up with the Prime Minister, where she commissioned our work on commercial fishing.

Curiously, I had a little hands-on experience in this arena, having as a student spent a month at sea aboard a prawn trawler off the coast of Queensland as the cook and prawn sorter, a time that I had enjoyed immensely; as a result, the topic quite appealed to me. The initial question we were being asked was a hard one – How could we use science and technology to improve our knowledge of commercial fish stocks? – but naïvely I was optimistic that we might be able to answer it. We had established some processes and momentum with our plastics project, and I assumed we could use and build on this approach to tackle this new question in the same cheerful ‘here to help’ way. How wrong I was!

It is worth emphasising that everyone we talked to during this project shared a remarkable passion for the ocean and, despite the challenges, we were very grateful for their willingness to share their views. Beyond a shared passion, though, the range of deeply held opinions was a long way from consensus, and it was a significant challenge to stay within our terms of reference, which were initially tightly scoped around ‘providing science advice to the Prime Minister on commercial fisheries (excluding aquaculture)’. That sounded simple. It was not. Some stakeholders were placed offside from the start simply by the scope and the framing of these terms of reference. Any amount of acknowledgement from us that science advice on commercial fisheries wouldn’t solve all the many problems faced by an increasingly challenged marine environment, globally or locally, fell on deaf ears.

We did our best to hear the criticisms. Commercial fishers were keen to emphasise that problems in the ocean weren't just caused by fishing, and those that *were* caused by fishing weren't just caused by commercial fishing. Those who had spent years fighting against commercial fishing and the legislative and regulatory framework used to oversee it were aghast that we were including commercial fishing experts on our panel and that our terms of reference effectively placed us within the confines of the Fisheries Act 1996.³⁷ Inclusivity is one thing and sleeping with the enemy is quite another. All this tension made choosing the expert panel a particular challenge, as we needed to balance expertise with a willingness to be pragmatic and make compromises. The latter criterion ruled out many experts who were simply not able to sit in a room together and engage in civil discourse. The wider reference group ensured that all views could still be heard, but we had to change the ways that documents were accessed so that individual reference panel members couldn't access the same version – we learned this the hard way after some fiery exchanges in the comments section.

If we were to make a difference, we needed not only to understand the perspectives of the industry and the challenges that faced commercial fishers, but also to get their input into designing policy solutions that worked in the real world. I was hugely grateful to my co-chair, who came from the fisheries world and also brought an excitement about the possibilities for science and technology, detailed knowledge of the complicated tangle of awkward relationships between science, government, and commercial fishing, and wisdom from the Māori world. He opened doors that enabled us to visit commercial enterprises and listen to their perspectives. These included large corporates, but also the little guys – sole operators operating on low margins who cared deeply about conserving the marine environment in which they fished. I joined a pāua fisher and a small crayfish boat in Rēkohu Chatham Islands; I talked to businesses fishing to order in as sustainable a way as they could, thirsty for information on how best to do this. These people were part of commercial fishing too, and knew more about protecting the marine environment than many of the scientists who were hectoring my team.

Our enthusiasm to include mātauranga Māori as part of the evidence base,³⁸ especially for inshore fishing, proved naïve. Trust was low, and local knowledge in the fishing world is valuable intellectual property. Navigating this issue was especially challenging because the range of views was huge, and arguably wider within the Māori world than elsewhere. To understand this, we needed to appreciate the history of the fisheries settlement,³⁹ which had been hard won and remained fiercely guarded. The settlement meant that commercial interests and Māori interests were aligned for some iwi,⁴⁰ but not for others. The need for a partnership approach with iwi to respect the Treaty of Waitangi and the Māori Fisheries Settlement was emphasised throughout our report and needs to be fully understood by scientists seeking change. As part of the settlement, the quota management system had been introduced and as such had been placed out of scope in our work. This triggered further outrage from those who championed more innovative solutions to fish stock management, especially as fish migrated across management areas with a warming climate. And so it went on.

To make our report useful, we decided we needed to document the complexities of the points of contention as objectively as we could, in order to expose the problems that needed to be solved. We acknowledged up front that solving these problems would need people to work together on a system change, as partners not adversaries. We also acknowledged that such a system change needed to address not just commercial fishing, but recreational fishing too. And not just fishing, but the many other environmental stressors on the marine environment – climate change, land-based impacts such as sedimentation, and pollution. We wanted to relay that we had at least heard all the voices and understood their concerns and the points of contest.

In placing our recommendations within a broader context, we strayed way beyond our originally agreed scope, having first ensured that the Prime Minister and relevant officials would accept this expansion. In the final full report, it wasn't until page 110 that we reached the place where we had thought we were going to start. With the blessing of the Prime Minister, we also strayed beyond the bounds of science advice, with a general call for overarching leadership in the ocean realm as our first recommendation.

The need for leadership across the many different strands of oceans governance was crystal-clear. Science can support the journey, but the governance of the oceans needs to provide a framework for this. We were delighted to see this suggestion implemented with the appointment of an Oceans and Fisheries Minister (and Under-Secretary) after the 2020 election. And although there have been major changes in the politics of the ocean with the latest change in government, the title of this portfolio remains, which is a step forward.

Although finding consensus was challenging among the wildly divergent views on how environmentally sustainable commercial fisheries were in 2020, nearly every stakeholder we talked to agreed we could do better in at least some areas. Many changes could be made in the short term to help the pendulum swing towards a greater emphasis on the environment in which we fish, and away from emphasising just the fishing itself. Conversations around innovation in data management, technology, policy, and collaboration could pilot good practice to catalyse change. These stood to benefit everyone, including commercial fisheries, which have everything to gain from a healthy marine environment.

Over the course of this work, many argued that the Marine Protection Area should be used as a protection tool,⁴¹ under the purview of the Minister of Conservation, and some suggested that the Resource Management Act should be used more often to protect the inshore environment and marine life.⁴² These conversations often ran parallel, creating indecision and hostility. However, other stakeholders identified that parts of the Fisheries Act 1996 that can enable protection of special marine habitats and an ecosystem approach to fisheries management were under-used.⁴³ The most striking example was perhaps section 9(c), which enabled the protection of habitats of particular significance for fisheries management – but had never been implemented. We emphasised that these provisions could be used in the short term and enabled immediate action. We challenged the Minister and the regulator to strengthen their arm and use these provisions to catalyse change.

A shared understanding of our environmental bottom line and collective aspirations for our environment were needed to

harmonise the many fractured conversations and bring all voices to the table. This was beyond even the expanded scope of our work, but we highlighted some local examples of coastal management where a collaborative, community-centred approach had made progress in setting up a framework for improving environmental outcomes.⁴⁴ The single biggest challenge to progress was the lack of trust and shared vision between stakeholders. In stark contrast to our project on rethinking plastics, there was a wide diversity of opinion among stakeholders about the need for – or even the direction of – change.

There is certainly no single accepted source of truth in the fisheries sector, and our report did not claim to be one. The inherent uncertainty in fisheries management is very easily manipulated to support a particular narrative. Passionate debate arises from differing interpretation of uncertain data sets, which supports conflicting narratives of ‘what the evidence says’. We tried to highlight where particular points of contention lay in interpreting data and were saddened by the number of incidences of ‘alternative facts’ that we navigated in the project. Where possible, we tried to explain the alternative interpretations of uncertain information. In other places, we highlighted where data, the interpretation of data, or both, were contested.

Overall, we concluded that while we do have a lot of data about the ocean, in many ways we also know frighteningly little – it’s dark down there. What we do know is often based on uncertain measurements that foster differing interpretations that fuel dissent. Further, the data we do have are poorly integrated across different stakeholders. The mountain of electronic and other data collected for compliance purposes could be better mined for environmental, commercial, and social outcomes. New tools can support this if the data are shared. Aggregation of non-sensitive data from industry sources and integration with data from a wider range of scientists from different disciplines and regulators could radically change the amount of information available on which to base decisions, and the decision-making processes need to be more open to incorporating these data in a transparent way. Deep local knowledge and mātauranga Māori are also under-used and we could listen more to on-the-ground expertise in local communities. In the meantime, lack of data is used by many to

excuse lack of action, which needs to change. Data are expensive to collect and information will never be perfect. Transparency in what we don't know, our levels of uncertainty, and how we manage this, is as important as sharing what we do know.

We documented how the industry levy funds vital data-gathering and research for significant commercial species but does not pay for basic public good research or research that would be valuable for other fished species. This creates a resourcing shortfall, unreasonable expectations around this funding, a lack of trust, and perverse incentives. We described many new high-tech tools and innovative ideas that could change the way we fish, but noted that public good-funded research is not always well connected to industry questions or environmental challenges. Fishers understand the issues better than anyone and have many great ideas, so empowering them to innovate and understand the basic biology of commercial species more fully would enable better fisheries management decisions that take an ecosystem approach – but this research is often not prioritised. Sadly, relationships between researchers housed in different institutions looking at different aspects of the marine environment often mirrored the poor relationships in the sector as a whole. We noted that a lot of energy was wasted trying to deconstruct an opposing narrative – energy that could have been better spent coming to a shared understanding.

As with Case Study 1, we kept officials fully informed of our work and our progress throughout the project. This was more of a challenge in this case, because officials in different ministries, departments, and agencies brought very different perspectives and gave very different feedback on our drafts, reflecting the lack of coordinated leadership in the marine environment. This contested space presents our under-resourced regulator with formidable challenges to keep pace with the ever-changing stocks, and I developed huge respect for the team at Fisheries New Zealand, who received our many questions and challenges thoughtfully and were receptive to change. That said, their policy interventions relied on plans; and while plans are critical for success, an agreed fisheries management plan is the beginning of a solution, not the end. Despite big strides in the introduction of electronic monitoring and cameras on vessels, we sensed a lack of confidence that plans would actually be implemented. We recommended making data

and information more accessible to help improve transparency of prioritisation and decision-making. This would benefit everyone by allowing more independent scrutiny, which can build trust.

Transparency in data analysis was also sorely absent in many parts of this project, and led us down some fascinating rabbit holes to get to the bottom of contested claims. In one example,⁴⁵ different stakeholders had sourced identical data sets from the same researcher and reached entirely different headline conclusions as to whether the annual area of the sea floor that is bottom-trawled in the New Zealand-controlled Economic Exclusion Zone was increasing or decreasing. The angry conclusions ‘It’s going up!’ versus ‘It’s going down!’ did little to unpack the important nuance in the situation. In fact, although the combined footprint of the new area being trawled each year was not increasing, this total included different areas every year. So while the sum of the new area trawled each year was trending down, cumulatively the total area trawled for the first time continued to increase.

Even a simple question such as ‘What is the current fish stock status?’ drew different answers from different interest groups. As defined by Fisheries New Zealand, by *value*, 75 per cent of fish stocks had no sustainability issues in 2019; by *volume* this dropped to 65 per cent; and by *number* it fell to 34 per cent (131 of a total of 388) mostly because 228 of the stocks had not been assessed.⁴⁶ The unsettled science and incomplete and uncertain data sets were a goldmine for those seeking sound bites to support their values-based assertions.

Slow processes, high data requirements, and contested analyses can discourage innovators from trying new fishing practices. A higher-trust, more permissive environment in which to trial and optimise new equipment could enable our innovators to flourish and address the many challenges in this space. Our report outlined ideas and innovations that could support smarter fishing in the future. We didn’t find any silver bullets. Not all the ideas were new, and not all the new ideas would be successful. But we concluded that, in challenging current thinking about how, where, and when we fish, we might start to move the conversation forward to create a future that is better than the past. We ended with an aspirational vision of the future to challenge old ideas and encourage new thinking.

Unlike all our other projects, the recommendations we presented were not from the expert panel but from the Office of the Prime Minister's Chief Science Advisor, 'drawing heavily on the expertise of our panel and the large number of contributors and peer reviewers, [though] few would endorse the report in its entirety'. The feedback on drafts of sections of the report had been extremely robust and the wording of our recommendations hard won. The lead writer of the rethinking plastics report on our team had been proud to be listed as a co-author, but with the commercial fishing report, the level of hostility towards the team led them to prefer a quiet acknowledgement. After some debate between the Minister, the Prime Minister, and their officials, we decided that a soft launch for the report made the most sense, and were relieved that it landed as well as we might have hoped in the contested space.

The full report was our longest,⁴⁷ and we published detailed appendices and references separately⁴⁸ – we felt strongly that we needed to capture all the data, and their limitations, so that everyone felt heard. We also released a short report⁴⁹ and invested a lot of time in ensuring that the website was as accessible as possible.⁵⁰ We were again lucky to be able to include Shirley Horrocks's excellent documentary video, capturing some of the challenges and conclusions of our project.⁵¹

Wishing to avoid sound bites and knee-jerk reactions, we did not put out a press release, simply announcing that the report was available via our social media channels. I also attended and spoke at meetings of non-government organisations and Seafood New Zealand, to share our findings. This meant that the press we received came some time after the reports were released, and included more in-depth analysis and commentary than might have been garnered from a press release.⁵² In the Beehive, the Minister responded to our report as part of a series of Cabinet Papers in the new portfolio of Oceans and Fisheries.⁵³ Fisheries New Zealand prepared a formal response,⁵⁴ and the report was used as a key part of the evidence base in the Fisheries Industry Transformation Plan.⁵⁵

So far so good. However, the change of government in 2023 brought a different direction of travel. Although the combined Oceans and Fisheries portfolio was retained, the Industry Transformation Plans were abandoned as a policy instrument.⁵⁶ This

meant that any progress made on our report would largely result from the industry's own actions, with one encouraging sign being that when the Minister withdrew the requirement for cameras on commercial fishing boats, the industry elected to keep them.⁵⁷ Despite the lack of progress, the evidence synthesis remains as an accessible reference document for anyone interested (for example, a researcher at an international philanthropic foundation has let me know that they have found it useful in their fisheries work), and would be easy for any interested parties to update.

What can we learn?

Wicked problems

Both case studies involved what have been described as 'wicked problems' – originally defined as policy problems that are not amenable to a complete solution and can only be ameliorated,⁵⁸ with any actions taken towards this amelioration likely to create other problems. Wicked problems are often also 'long problems' [→CHPT.9].⁵⁹ Each wicked problem is unique, but they also have features in common.

These two case studies have, on the face of it, much in common. Both started with an environmental problem for which scientific evidence across a range of disciplines and perspectives could have been better used to support solutions. And for both, gauging the success of policy interventions was likely to be challenged by a paucity of adequate data, though enough was known to provide evidence to inform policies that would move the dial.

In each case study, a complex system change across multiple domains is required to mitigate a challenging environmental problem where social, environmental, and economic issues are entangled. The critical differences between the two centre around the extent to which the problem is accepted and acknowledged, and the degree of so-called social licence for change. Social licence is a widely used term that means different things to different people in different contexts;⁶⁰ as such, it is 'contested on almost every imaginable dimension'.⁶¹ While it remains useful to understand the degree of social licence in its broadest sense to support how a project is framed, executed, and delivered, a more explicit interrogation of the consensus in values ('hearts') and consensus in the science ('minds') might prove more useful.

Hearts, minds, and consensus

The degree to which values are contested on a particular topic is an important test of the likely reception that a science advisor might receive when attempting to support decision-makers and policy-makers with evidence. Pielke has used the examples of ‘tornado politics’ and ‘abortion politics’ to capture contrasting scenarios.⁶² With a tornado, a general consensus that lives should be saved is likely, and forecasts of the strength and trajectory of the storm are going to be welcome. With the case of abortion, though, the values debate is dominant, and the voice of science is less likely to be relevant or heard. Craig added a third category, ‘ecstasy politics’, reflecting topics such as recreational drug use [→CHPT.5] where the values are under debate and the science is also unsettled.⁶³ As Pielke observes:

the types of information that are significant for decisions are a function of political context – specifically science plays a different role in situations of values consensus and low uncertainty than in the opposite circumstances.⁶⁴

Whether or not the science ‘is settled’ can become an unhelpful point of contention in any evidence synthesis, and one that is often exploited politically. So, if a topic is contested, it is very important to say so, cite different views, and give an objective as possible summation of where the balance of evidence lies. Alternatively, a ‘behind-the-scenes’ role might be more successful, as when I supported the Prime Minister in setting methane targets amidst a noisy public debate [→CHPT.9/QUESTION 4].

In an evidence synthesis, it is advisable to avoid ‘ruling’ on an issue, and to instead make sure that everyone is heard and carefully acknowledged, with points of contest highlighted. Extensive and balanced peer review is absolutely vital when summarising contested science to ensure that all sides of the debate are comfortable with how the spectrum of opinion and the balance of evidence have been portrayed [→CHPT.4]. When polarised values are combined with polarised scientific opinion, science advice becomes especially challenging. In situations of uncertainty, scientists are at risk of aligning themselves behind different values positions,⁶⁵ rather than coming together to try to clearly express the degree of consensus and uncertainty.

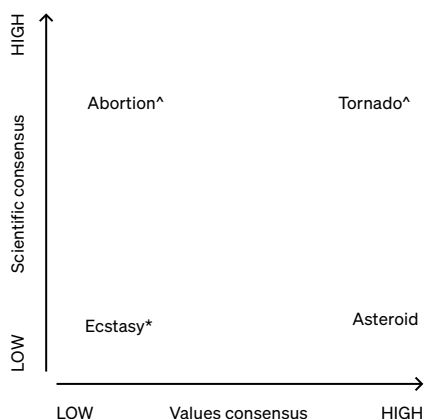


Figure 1: Introducing the scientific and values consensus quadrant. Understanding where the topic sits within this quadrant at the beginning of a project can support good process, stakeholder engagement, and communication.

^{*}Craig (2019), [^]Pielke (2007)

It is helpful to assess up front where a topic sits in terms of both scientific and values consensus [→CASE STUDIES 1/2]. This analysis can help frame the project and inform the processes that might be used to undertake it – for example, the degree and nature of stakeholder engagement, whether to include a vision as part of the work, and the degree and type of communication to the wider public. Building on Pielke’s and Craig’s ideas, Figure 1 provides a tool to do this.⁶⁶ The abortion, tornado, and ecstasy examples are placed on a quadrant, and a further example – of an asteroid hitting the earth – is included to complete the set. The asteroid is an example scenario where we find a high values alignment but poor scientific consensus. There would likely be general agreement that an asteroid strike on the earth should be avoided, but considerable uncertainty on how and whether this might be achieved. In this scenario, expressing this uncertainty would be vital!

Of course, the two axes are not always entirely independent,⁶⁷ and the degree of consensus on either axis may shift with time [→CASE STUDY 5]. Nevertheless, the simple quadrant provides a tool to begin to unpack the degree of contention surrounding particular topics.

Returning to Case Studies 1 and 2, the difference between them is immediately apparent when we place them on the quadrant [→FIG. 2].

In the rethinking plastics case study, consensus was high in both dimensions. This meant that even across disciplines and

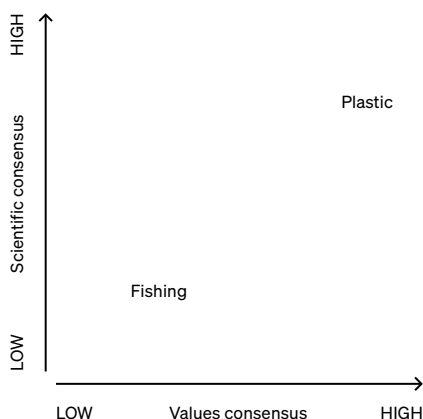


Figure 2: Testing whether hearts and minds are open to change – scientific and values consensus quadrant for Case Study 1, on rethinking plastics, and Case Study 2, on commercial fishing.

perspectives, we found a willingness to work together to find common ground and solve the problem. The inevitable uncertainties arising from a lack of data frustrated those wanting to do detailed analysis, but did not thwart setting a direction of change. A widely bandied statistic, that only 9 per cent of plastic ever made has been recycled,⁶⁸ could be the source of endless quibbling, and it would certainly be useful to have more data to interrogate the success of policy interventions. However, with most people in agreement that the percentage is way, way smaller than it needs to be for life on our planet to be sustainable, it doesn't really matter, and certainly doesn't derail conversations that move solutions forward.

By contrast, in the commercial fishing case, consensus was low in both dimensions. The uncertain evidence base was exploited and used as a proxy for a values debate (→ CASE STUDY 2). For example, critical decisions on fish stock management are based on the percentage of fish remaining in the ocean, which is hard to measure, compared to the so-called unfished stock volume, a theoretical figure with a value fraught with uncertainty and built on assumptions that are constantly challenged. The simple statement that 'if stock volume falls below 20 per cent then action will be taken' triggers furious debates as to the accuracy of the count and the estimate of the unfished volume. Both are inexact and uncertain, and people are keen to seize upon this uncertainty and grab a number within the error margin that supports their argument, rather than acknowledge the bigger problem – that many of the

decision thresholds sit within the often large and fluctuating margin of error of this calculation.

Quoting Blastland and Spiegelhalter:

people are learning more...all the time, so it won't be long before there is new data. This fact is not just awkward, it's relevant to the argument, What kind of trust can you place in numbers that don't stand still?⁶⁹

The difference in tolerance to uncertainty according to how well an answer aligns with a values position is analogous to the way that the numerical analysis of a risk that a person faces in a given situation sits in tension with their perception of that situation;⁷⁰ the tiny odds of falling out of the sky on a given flight do not tend to comfort those with a fear of flying. In the same way, quantifying uncertainty is far more problematic in situations where there is a low values consensus and strong beliefs. 'Reason will tangle with feeling and impulse, belief will quarrel with evidence.'⁷¹

Uncertainty gives political wiggle room

This muddle of values with scientific evidence is amplified in the political arena. In general, politicians prefer to communicate a simple number rather than more nuanced confidence intervals, and the media tends to exacerbate this in the push to create easily communicated sound bites. It becomes all too easy to state a simple number and then defend it, turning an uncertain, fuzzy limit into a political line in the sand.

The challenge of communicating statistics and probabilities is a subject in its own right.⁷² Even between scientific disciplines, and especially between researchers and the general public, misunderstandings abound, particularly when words feel familiar but are used in different contexts. For example, innocent use of the word 'abundance' in the fisheries context can unwittingly convey an assumed values position and evoke an impassioned response. We tried hard in all our projects to find and unpack these trigger words to defuse some of the interdisciplinary crossfire and reach a shared language and understanding.

Another challenge that becomes steeper in contested environments is that the observational evidence that is synthesised is always about the past, and policymakers need to know the likely

future consequences of decisions made now.⁷³ The relationship between the two is always fraught, and reliant on assumptions that may or may not turn out to be reasonable. In the plastics space, the general acceptance that the trend line for plastic waste needs to be reversed means that specific projections are less likely to be contested. In fisheries, this same challenge creates another set of points for rebuttal and debate, often masking a values position about the degree to which humans have a right to harvest food from the ocean, who specifically has those rights, and who should benefit from the catch.

Needless to say, the recommendations were much easier to craft, and to get accepted and implemented, for rethinking plastics than for commercial fishing. With hindsight, it might have been more useful to query the request for recommendations in our terms of reference, and instead offer an evidence summary without recommendations for this highly contested topic, leaving policymakers and politicians to synthesise scientific and non-scientific inputs.⁷⁴

A positive vision can inspire action (or antagonism)

Creating a vision of how the future might look, if all the recommendations were followed, had a different trajectory in each project. The vision of a New Zealand in which our relationship with plastic had been reset was fun to write and easily garnered enthusiasm within and beyond the project. Perhaps surprisingly, it was also quite easy to produce the vision for our commercial fisheries work – it was not too hard to imagine a future to which most parties would sign up. However, the disconnect between the fractured present and the utopian future seemed much larger, and decision-makers felt unable to get behind a shared future at a time when key parties could not sit in a room together and agree on the present state. Our compromise of including the piece at the end of the report for those who were ready seemed the best we could do. Whereas the opening vision section of our plastics report was celebrated, the expert panel, our team, and officials debated whether to even include our vision for commercial fishing, with concern that it would be poorly received. Positive messaging is hard when many stakeholders are angry. I am glad that we included it, however, and it attracted positive comment from those who read it as part of the Fisheries Industry Transformation Plan work.

Commercial fishing, Chatham Islands.
Photograph: Juliet A. Gerrard



The potential of narrative fiction to explore futures thinking is an interesting topic (→CHPT.6).⁷⁵ We found that our vision statements provided an entry point into exploration of the evidence for those who were less inclined to trawl through our tomes of dry text (→CASE STUDIES 11/12). While our reports strove to provide a balanced view of the evidence to answer the question as commissioned, and not to stray into advocacy, the vision statements empowered advocates for change, an important secondary audience for our reports. A values and science consensus make it easier for such a piece to capture the imagination of those who will implement change. The case studies we included in both projects were similarly used to inspire best practice by champions for change. Although not celebrated in the same way that our plastics case studies were, the case studies in the commercial fisheries project led to a podcast by a talented intern, who brought the stories to life.⁷⁶

It is interesting to reflect on why plastic has captured the public imagination in a way that other pressing environmental problems, such as climate change, have struggled to do. Perhaps the very visible nature of the issue, the powerful advocacy and imagery from those protecting the oceans, and the fact that the very real day-to-day choices that we must make about the use and disposal of plastic give a sense of agency and responsibility. There may be value in interrogating how to use the focus on plastic as an entry point to other tragedies of the commons⁷⁷ affecting the global environment. Can we trigger the same sense of environmental awareness as we fill up the car with petrol, or switch on the lights, that we do when we say no to plastic bags?

Consensus is not fixed in either dimension

It is also worth acknowledging that no topic is immune to a shift in the consensus of hearts and minds. I live in hope that greater consensus will be found in the fisheries domain, and that our evidence base and others like it will provide a platform for change in industry, government, and the public. The call for action in the oceans continues to grow,⁷⁸ and the more critical attention that is focused on the claims and counter-claims, the stronger the case for change becomes.

On the other hand, we can't assume that the plastics argument is won; efforts to finalise a Global Plastics Treaty have so far

failed, with powerful interests yet to agree, despite enormous global support for a legally binding instrument.⁷⁹ Not everyone is persuaded that our plastic use should be reduced, so the tide could yet turn. One MP in New Zealand argued that busy people had a right to choose whether they accepted plastic bags at the supermarket. And in the US, supposedly annoyed by a collapsed paper straw, Donald Trump's campaign manager launched 'Trump plastic straws' as a fundraiser in 2019,⁸⁰ raising US\$460,000 with a tag line that 'liberal paper straws don't work'.⁸¹ Recent reports suggest that a policy reversion will now be enacted.⁸²

Presenting the 'facts' rarely changed anyone's mind, and as such policymaking has been characterised as a political struggle over values and ideas⁸³ – in which values, not factual information, hold the key to understanding policy conflicts. Understanding this is important to prevent scientific debate from becoming a proxy for values debate.⁸⁴ We will see an example of a shifting position in the consensus quadrant in real time during the pandemic [→CASE STUDY 5] and the impact this had on how receptive people were to a strengthening evidence base as the values position shifted.