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POINT-OF-VIEW

Ocean resource use: building the coastal blue economy

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Abstract Humans have relied on coastal resources for centuries. However, current growth in population and increased accessibility of coastal resources through technology have resulted in overcrowded and often conflicted spaces. The recent global move towards development of national blue economy strategies further highlights the increased focus on coastal resources to address a broad range of blue growth industries. The need to manage sustainable development and future exploitation of both over-utilised and emergent coastal resources is both a political and environmental complexity. To address this complexity, we draw on the perspectives of a multi-disciplinary team, utilising two in depth exemplary case studies in New Zealand and within the Myanmar Delta Landscape, to showcase barriers, pathways and actions that facilitate a move from Business as Usual (BAU) to a future aligned with the Sustainable Development Goals (SDGs) and the UN International Decade of Ocean Science for Sustainable

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Development 2021–2030. We provide key recommendations to guide interest groups, and nations globally, towards sustainable utilisation, conservation and preservation of their marine environments in a fair and equitable way, and in collaboration with those who directly rely upon coastal ecosystems. We envision a sustainable future driven by conflict mitigation and resolution, where:

(i) Change is motivated and facilitated
(ii) Coastal ecosystems are co-managed by multiple reliant groups
(iii) Networks that maintain and enhance biodiversity are implemented
(iv) Decision-making is equitable and based on ecosystem services
(v) Knowledge of the marine realm is strengthened—'mapping the ocean of life'
(vi) The interests of diverse user groups are balanced with a fair distribution of benefits

Keywords UN sustainable development goals · Blue growth · Blue economy · Multidisciplinary · Decade of the ocean · Conflict resolution · Equity · Sovereignty · Marine Conservation

Introduction

Humans have long exploited marine ecosystems (Smith and Zeder 2013; Zacharias 2014; Novaglio et al. 2018) and industrial change, accelerated since the mid-twentieth century, has enabled coastal states to expand their territories and wealth through maritime trade, migration, and the exploitation of marine resources across the globe (Zacharias 2014; Alexander 2019; Jouffray et al. 2020). Global ocean economic activities are estimated to be worth US$1.5 trillion per annum, with blue growth expected to continue at a faster rate than terrestrial activities for at least the next few decades (US$3–5 trillion by 2030 OECD 2016, 2019). This growth however, is affected by the inherent contest within coastal spaces which current policy and management strategies struggle to fully address (Alexander 2019). The nexus between ideas around sustainability and what constitutes blue growth remains contentious (Jouffray et al. 2020), and purposeful change towards a more environmentally, economically, socially sustainable and just blue economy is required.

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The blue economy: ocean sustainability and the economic Agenda

The last half century has seen concerns escalate over the impacts of human activities on marine ecosystems, giving rise to various initiatives seeking to incorporate the concept of sustainability into policy (Stojanovic and Farmer 2013). This has meant that recent initiatives, collectively called the blue economy, comprise a range of economic sectors and related policies that together determine whether the use of oceanic resources is sustainable. An important challenge is thus to understand and better manage the many aspects of oceanic sustainability, ranging from sustainable resource exploitation to ecosystem health to pollution (The World Bank 2017: xi). This vision's origins sit within the 'Green Economy' (Pearce et al. 1989), which has been defined by the United Nations Environment Programme (UNEP) as an economic model 'that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities' intended to deliver a low carbon, resource efficient, and socially inclusive economy. The concept gained traction in 2008 in response to the combined problems of the global financial crisis and global environmental challenges, with the UNEP advocating for the green economy 'to address multiple crises' (UNEP 2011).

The concept of the 'Blue Economy' came to the fore when, during preparations for the Rio + 20 or Earth Summit (UNCSD 2012), many coastal nations (particularly island states) expressed concern that the green economy primarily addressed land-based resources but neglected the role of the oceans in the economic and cultural lives of hundreds of millions of the world's poorest and most vulnerable coastal and island nations. About 97 percent of the world's fishers, for example, live in developing countries, with fishing their major source of food and income (Kelleher et al. 2012). Threats to oceans, therefore, have the potential to engender widespread suffering, displacement and

unrest. Consequently, the UN was urged to incorporate the 'Blue Economy' into discussions. As a result, member states pledged to protect and restore the health, productivity and resilience of oceans and marine ecosystems to maintain their diversity, enabling their conservation and sustainable use for present and future generations (UNCSD 2012).

More recently the United Nations Human Settlements Program produced a background paper on cities (UN-Habitat 2018) that proposed an expanded definition of the blue economy to encompass all waterbodies, including the world's oceans, lakes, rivers and wetlands, with the increased prevalence of drought set to be an extreme emerging issue globally. It also recognised that 'cities are at the forefront since most urban centres ($\sim$ 70%) are located along coasts and waterfronts around the world' (UN-Habitat 2018: 6).

The blue economy remains an 'ever evolving concept' (Roberts et al. 2016). It is a concept with an inherent conflict at its core—between sustainable use, economic growth, and the need to align implementation in accordance with multiple, often competing, stakeholder groups (Voyer et al. 2018; Schutter and Hicks 2019) and, more recently the Sustainable Development Goals (SDGs) (Lee et al. 2020). Addressing this conflict requires resources—either material and financial or in terms of time, patience and embodied power. Such resources are out of reach for many coastal nations, meaning efficient development of blue economies has typically been centred in locations with low conflict, high biodiversity, good governance and financial resourcing, such as the Seychelles (Schutter and Hicks 2019), Costa Rica (Mustafa et al. 2019) and New Zealand (Lewis 2018).

The blue economy: conflict in coastal spaces

Coastal conflicts are ubiquitous and include contest over resources, values and cultures. Conflict over access is an embedded dynamic that affects responses to change and management (Meyer-McLean and Nursey-Bray 2017). However, the scope of marine and coastal conflict goes further than access to resources: it is about justice, wellbeing, and good governance (Alexander 2019). Conflict is caused by the ebb and flow of power relations between different stakeholders, charged by differing perceptions of management priorities (Weible 2005; Stevenson and Tissot 2014) and institutional inertia, high transaction costs and poor communication among institutional actors (Alexander and Haward 2019). Yet, conflict in galvanising competition and accountability can also facilitate incentives for collective action, and create new rules, norms and practices between and within interest groups (Basurto et al. 2016). In facilitating collective action, conflict can also be transformative and provide the impetus to generate social and adaptive learning within a blue economy (Nursey-Bray 2017; Alexander 2019).

Meanwhile, governments across the world are embedding the idea of the blue economy into their national development planning, making their sovereign sea space visible and conceptualised as an economic space (Choi 2017; Steinberg and Kristoffersen 2018). Conflict as a discrete dynamic, remains a determining factor in the success of the implementation of the blue economy in practice. Sometimes, the inherent existence of conflict can lead to the creation of new conflicts: Norway is a case in point. In positioning itself as the Arctic Ocean's "rightful and natural steward" and asserting the blue economy as the frame to make claims to maximise economic production and conservation across a range of sectors and regions in the Arctic, Norway is exerting governmentality over ocean space which is also the space traditionally used by artisanal fishers (Steinberg and Kristoffersen 2018). In the process of being removed from their traditional fishing grounds through top-down governance and policy that aims to replace them with "more sustainable industries" (such as aquaculture Choi 2017), new contested conflict arenas emerge.

In this paper, we use a comparative case study approach to explore how the development of the blue economy may further heighten conflict in the most congested marine space—the coastal zone; where access to resources, justice, wellbeing, and economic benefit have heightened complexity. Economic growth in adjacent and interconnected inland areas ('the Green Economy' UNEP 2011) and offshore waters (addressed in Novaglio et al. 2021) deepen societies' imperative for meaningful blue economy implementation.

While some nations are taking an intentional approach to the blue economy, for others it is emerging from the many activities happening in their coastal zone. The two case studies that are the focus of

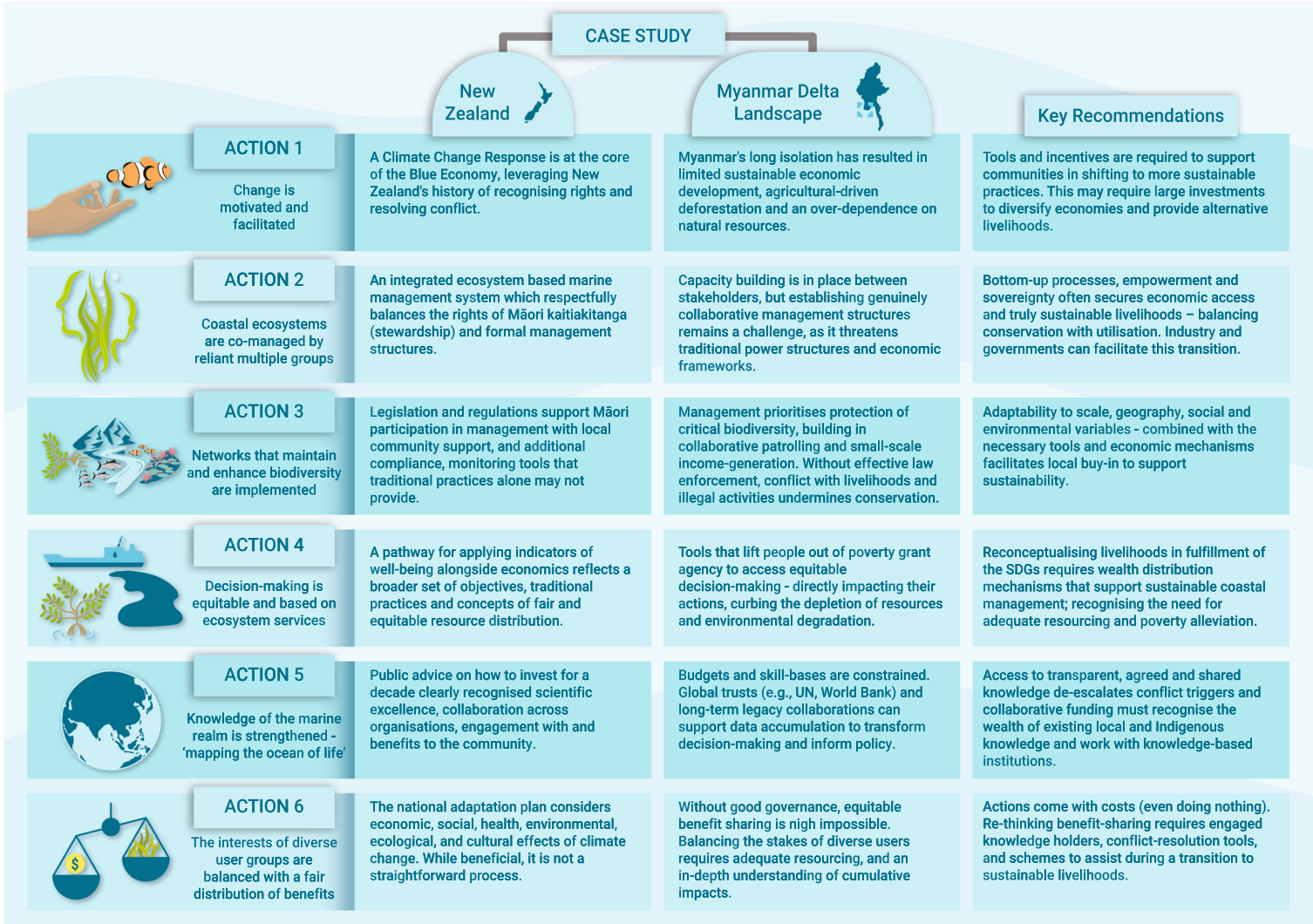

Fig. 1 Summary matrix depicting six actions toward a sustainable blue economy applied to two case studies from New Zealand (Aotearoa) and the Myanmar Delta Landscape (Burma) with key recommendations for blue economy management

this discussion were chosen because they illustrate different journeys towards sustainability and the development of a robust blue economy. Factors such as historical and present-day conflict, and differing approaches to conflict resolution, have led to these nations developing dissimilar governance capacities for implementing their blue economy associated strategies.

The New Zealand case study

Considers New Zealand's national-scale blue economy, with a specific reference to the Sustainable Seas and Moana project (https://www.moanaproject.org/) and the coastal spaces encompassed by an Exclusive Economic Zone covering 4,083,744 km^2 (Brown 2008). New Zealand has low societal conflict (Besley and Peters 2020), high marine biodiversity (Gordon et al. 2010), good governance and financial resourcing for blue economy implementation (Bargh 2014; Winder and Heron 2017; Lewis et al. 2018).

New Zealand has taken a planned approach, developing a national blue economy pathway in preparation for 2021 (Sustainable Seas Challenge (2015–2024) (Bargh 2014). This approach has provided a foundation upon which to resolve conflict for the common interests of the nation, and Pacific Island neighbours.

The Myanmar delta landscape case study

Reflects on the Myanmar Delta Landscape, at the finer-scale in the Ayeyarwady Delta which features the $\sim$ 137 km^2 Meinmahla Kyun Wildlife Sanctuary, recognised under Myanmar's National Biodiversity Strategy and Action Plan and designated as a Key Biodiversity Area and conservation corridor of 5300 km^2 (Harris et al. 2016). Myanmar more broadly, has high (but largely undocumented) marine biodiversity (Maxwell 1904; Tezzo et al. 2018; Hykle et al. 2020), high conflict with strong military governance (e.g., mass conflicts in Rakhine State (Arraiza and Davies 2020)), and the transition from conflict to peacebuilding is fraught with complexity (see International Crisis Group for conflict trends and opportunities to advance peace: www.crisisgroup.org). A lack of adequate resourcing further restricts capacity for sustainable marine-based livelihoods (e.g., aquaculture Tezzo et al. 2018).

In Myanmar, a five-year management plan was proposed for the Meinmahla Kyun Wildlife Sanctuary and adjacent Myanmar Delta Landscape beginning in 2017 (Government of Myanmar 2011, 2015 and Myanmar Landscape Management Plan *unpublished*), contributing to Ramsar designation the same year (Zöckler 2017, Zöckler and Aung 2019). Initiatives were designed in consultation with government, community, local and international Non-Governmental Organisations (NGOs) and other stakeholders with inputs from ecologists to social scientists (Macintosh 2016a, b; Phua and Savaëte 2016; Thein Gi 2016; Saw Han Shein 2016; Yong 2016) (coordinated by K Meyers and N Bax). In the Myanmar Landscape, as late as 2021, despite approval of the management plan in 2018, the capacity to implement and enforce no-take designations in areas of high biodiversity remains non-viable. And governmental negotiations continue without resolve, whilst economic livelihoods remain centred on illegal activities (Z Lunn pers.comm).

Research approach and methods

For this paper, we adopted a combined methodology based on a blue economy actions framework provided under the UN Decade of Ocean Science for Sustainable Development 2021—2030 Implementation Plan (IOC-UNESCO 2020) and case study approach (Yin 2018), extending on the overarching Future Seas project methods of Nash et al. (upcoming). This involved an interdisciplinary team composed of researchers from different career stages and different disciplinary backgrounds (from biophysical sciences to economics, history, philosophy, social sciences and indigenous knowledge holders) collaborating through a series of workshops and meetings in 2018 and 2019. The group took what is broadly a "future backwards" (or backcasting; e.g. Nash et al. upcoming) approach. This approach followed three broad steps: (i) identify key drivers that society can influence and that will impact the future of the coastal blue economy; (ii) determine shifts in the intensity and/or direction of these drivers that will lead to two possible futures for 2030; and (iii) identify tangible actions that can act on the drivers and thus support society in moving towards the more desirable of the two futures. The first future was what might conceivably occur if society remains on the current most likely pathway (given trends over

the past 10–15 years), a Business as Usual (BAU) future. The second future involved transitioning industry and society to achieve the UN Sustainable Development Goals (SDGs), a more sustainable future. After much discussion, the group defined conflict resolution as the key driver for a sustainable coastal future and consequently the focus of blue economy actions. Six key actions determined during discussions guide analysis of two case studies; one from New Zealand and the other from the Myanmar Delta Landscape, chosen based on the expertise within the co-authorship. This methodological framework explores the similarities and differences in conflict created by development of the blue economy and its resolution across different economic developmental and geographical scales. To provide a frame for our case study analysis, we collectively synthesise the literature and expertise to visualise the two futures**.**

(i) The BAU is a continuum of current trajectories based on economic growth and increased conflicts for space and resources (Stephenson et al. 2019). We envision climate change, extreme events and sea-level rise impacting negatively on coastal ecosystems and further increasing conflicts across different sectors (and nation states) (Trebilco et al. 2020), often with antagonistic needs and future strategies competing to maximise their share of the limited coastal space (Owsiak et al. 2019). Naval investments expand, but maritime policy continues to develop piece-meal as responses are siloed sector by sector with limited integration and management (De Santo 2020; Galani and Evans 2020). Meanwhile, unchecked industrial development in offshore areas add (rather than alleviate) impacts on coastal systems through, for example, increased pollution, competition for port access and exploitation of interconnected resources. Attractive opportunities for offshore economic growth result in similar conflicts over space and resources to those already experienced by coastal states (Novaglio et al. 2021). Global inequities (e.g. nutrition, gender, decent livelihoods) and the wealth divide increase with many people gravitating to coastal cities, especially as some locations become unlivable (Puskic et al. 2020). Marine spatial planning and co-management policies become more widespread, but struggle with the magnitude of the problem, the growth focus and the reactive approach to environmental and sociocultural issues (Armitage et al. 2009). Technological and infrastructure-oriented interventions tend to dominate (Trebilco et al. 2020), with impacted coastal communities demanding coastal hardening and protection of coastal assets. First Nations, small-scale producers and conservation interests remain marginalised in many locations (Fischer et al. 2020). To avoid the increasingly polluted and hazardous nature of coastal areas, recreation increasingly switches to virtual experiences and artificial venues (Loureiro et al. 2020). The degradation of large stretches of coastline epitomise society's failures, people turn away and they lose their iconic status, hastening their demise.

(ii) The more Sustainable Future of 2030 is one that reflects a higher degree of achievement of the Sustainable Development Goals (SDGs) and is conditional on conflict mitigation and resolution. Climate change and extreme events impact coastal systems inspiring a cultural shift in focus, helping to drive a global re-orientation in political and economic thinking to a sufficiency paradigm. This pivot includes the emergence of a sustainable blue economy. Indeed, it is so pervasively adopted as a broader view that what constitutes a sustainable blue economy forms, one in which up-stream stakeholders are drawn into the vision, facilitating changes in watershed use (e.g. major river systems are no longer used for waste disposal, and improved agricultural practices and urban design are implemented). The importance of blue carbon (Bax et al. 2020), including carbon offsets, is recognised and helps drive integrated management of key coastal ecosystems with flow-on benefits to coastal communities, tourism, seafood producers and coastal protection. Offshore areas offer spaces for clean energy and food production and innovative carbon drawdown technologies relieve pressure on coastal systems, providing ecological restoration opportunities (Novaglio et al. 2021). This holistic, integrated approach has replaced the previous individual sectoral focus, helping to provide food security and resolve issues of sovereignty. All of this is made easier by the removal of critical policy barriers, and the emergence of integrated and participatory co-management, which cultivates a greater sense of responsibility and accountability (Stephenson et al. 2019). This shift directly addresses cumulative effects, trade-offs and helps to resolve conflicts, as well as contributing significant global investments to capacity building. Extraordinary leadership is evident, from ministerial to local champions and encompassing all demographics, and career-stages (Brasier et al. 2020).

Positive change is supported due to the iconic place coastal and marine systems hold in many cultures (Board 2008). The true value of these iconic systems is celebrated by the majority.

Beginning from these two visions, there are a number of barriers to achieving a transition from a BAU to a more Sustainable Future, but there are also at least six actions we feel are required to achieve a more sustainable future by 2030. In the following sections we use the two visions and six identified actions (summarised in Fig. 1) as a methodological framework to analyse our case studies and to develop more general key recommendations on how to achieve the Sustainable Future.

Before going further, first a note on context. We acknowledge that the disruptions of 2020, in particular the COVID-19 pandemic, are currently causing major changes to economies and socioecological systems at the global scale. The BAU scenario we describe is based on evidence from the recent past prior to the pandemic and assumes a general return to this trajectory within the next few years. We note that current disruptions to the global ocean, environment and society created by COVID-19 may indeed present a platform for change and an opportunity to 'reset' trajectories in the coming decade (as discussed in Pecl et al., in preparation). The sustainable future presented here is one option for such a shift. Already, patterns of ethical decision making and leadership in New Zealand has seen early intervention during the COVID-19 epidemic (Baker et al. 2020), and this approach is expected to be economically more effective long-term (Carr 2020; Wilson 2020). Like many poorer countries, Myanmar is unfortunately seeing irreparable economic hardship, and targeted fiscal measures and sound macroeconomic policies are urgently needed to absorb the economic shock (World Bank 2020). Financial support strategies have increased globally in response to COVID-19, which (despite disruptions) have also provided an opportunity for countries to rethink population needs and implement social protection mechanisms ranging from non-contributory transfers to universal income measures (Gentilini et al. 2020). This could set an international precedent to continue such actions and apply them more readily to assist conservation efforts and mitigate climate change in the future. For example, the volatility created by the military coup on February 1, 2021 is a serious set-back for Myanmar's peacebuilding process. Thinking ahead to building back better, if Myanmar returns to a democratically-elected government, then financial aid mechanisms can be targeted to vulnerable people and biodiversity.

Results and discussion

Action 1: Change is motivated and facilitated

A first step in any behaviour transition is to recognise the problem and commit to action. Resolving conflicting objectives for coastal zones, whether between industries, government and communities or between short-term needs and the long-term desires of individuals in society will be fundamental to progress.

New Zealand

Currently New Zealand is shaping sustainable futures locally and globally by leveraging its history of conflict resolution (e.g. the Treaty of Waitangi 1840, land and marine-tenure resolution and shareholder rights) (Bargh 2018). It has made steps towards decarbonisation of the blue economy through development, agreement and implementation of the *Climate Change Response (Zero Carbon) Amendment Act 2019* (Leining et al. 2019). It is also actively facilitating the enhancement of sustainable practices and resources through the Sustainable Seas National Science Challenge (www.sustainableseaschallenge.co.nz/).

Myanmar delta landscape

Due to its long isolation under the military regime (Bünte 2014), Myanmar (previously Burma) has been relatively siloed from the outside world. In the Ayerwaddy Delta this isolation, together with increased migration to the delta in search of exploitable products (e.g. forestry, fishing and agriculture), has resulted in agricultural-driven deforestation of mangrove ecosystems and an over-dependence on natural resources (Yong 2016). While local inhabitants are keen for new opportunities sufficient resources to facilitate this are not available.

Key recommendation

Having sufficient resources to see through change removes one of the underlying tensions in any community—there is only so much to go around, and who loses out? While resourcing won't remove the need to recognise trade-offs and engage in some negotiated outcome, it reduces conflicts created by power differentials steaming from access to resources (either to argue your position or to support transition to new approaches and livelihoods). Large investments are needed to diversify economies, supporting communities to transition into alternative livelihoods and providing them with tools and incentives to shift to sustainable practices. Response pathways could include financial schemes such as a universal basic income (Coote and Percy 2020) or conditional or unconditional cash transfers (Haushofer and Shapiro 2013) similar to those often applied in disaster relief programs (Régnier et al. 2008; Gyawali et al. 2019; Norton et al. 2020). Collaboration between countries and within international institutions is essential to ensure that all states have the financial capacity to support such schemes or the tools to build this capacity in a reasonable time frame. This level of support would improve the resilience and social safety of communities and instigate an economic transition away from counterproductive activities—such as illegal extraction of mangroves, fish and crabs in Myanmar (Macintosh 2016a, b; Yong 2016). Innovative approaches may combine these initiatives with others, such as leasing of key conservation sites by philanthropic groups, capacity building around carbon market (and offset) opportunities or other sustainable livelihoods (Hejnowicz et al. 2020).

Action 2: Coastal ecosystems are co-managed by multiple reliant groups

Co-management reflects broader societal concerns to resolve conflict and incentivise forms of collective action (Lozano and Heinen 2016), with the intent to share power and responsibility between government and stakeholders, including those that may value its intrinsic and cultural components (Berkes et al. 1991; Haas et al. 2020). This type of co-management can lead to changes in the attitude and behaviour of government and build community capital and adaptive capacity (Nursey-Bray et al. 2018).

New Zealand

In New Zealand, the rights of Māori to exercise cultural practices are being increasingly recognised through environmental management. However there remains a need to increase the capability of Government (at different levels) and to understand Māori values, rights and practices, and support for Māori to increase capacity in the context of natural resource management. An obstacle for the Sustainable Seas National Science Challenge has been to develop a marine management system for New Zealand which respectfully balances kaitiakitanga (guardianship and protection of environment) with Ecosystem Based Management (EBM) within a Māori perspective based on reciprocal obligation (Maxwell et al. 2020). Multiple forms of localised collectives have worked together to develop cross-sectoral marine spatial plans, including integrated harbour management plans and effective coastline guardian groups (Makey and Awatere 2018; Peart 2019; Te Korowai 2012). Minimising complexity, strong leadership, and good facilitation support are critical for the success of these bottom-up initiatives (Lawless 2015).

Myanmar delta landscape

Capacity building is in place between local and international NGOs, with NGO networks providing collaboration across the larger delta-network, including with national Universities interested in working on monitoring initiatives. Unfortunately, establishing effective and genuine collaborative management structures remains a challenge (Khin et al. 2020). This is because the most complex barrier to achieving co-management in the Myanmar Landscape is the role of elite actors across multiple interest groups, power structures and market chains (Burcham et al. 2020), where many competing priorities and inequities exist (Lwin et al. 2020). Those in power often view sustainable development as a loss of their stake in the blue economy (Musgrave and Wong 2016), especially when their power is reliant on maintaining ownership over resources and market chains, manifesting in socio-economic power over people via debt

cycles and their ability to assert self-interested policy making.

Key recommendation

Co-management allows multiple voices to be heard, multiple viewpoints to be incorporated, helping to reduce any sense of exclusion or deception (Daw et al. 2015), and ultimately providing a robust means of reducing conflict. To redesign the global blue economy, the New Zealand example points towards a need for strong sovereignty to underpin secure economic access and truly sustainable livelihoods—balancing and valuing resource conservation with utilisation. Where sovereignty is not easily determined, as in the Myanmar Landscape, this will depend largely upon good governance (Kenney-Lazar and Mark 2020). Achieving co-management comes from a recognition of bottom-up processes, engagement, discussion and empowerment (Delabre et al. 2020). This has to go beyond simple calls for change to true support for shifting the power balance and realising the benefits of co-management. While in some instances the positive overall outcomes have been sufficient motivation for decision makers to remain engaged, even as their absolute power is eroded (Smith et al. 1999), in other cases alternative roles and opportunities do need to be found to support those who would otherwise feel undermined and resist change.

Action 3: Networks that maintain and enhance biodiversity are implemented

Biodiversity protection networks, such as Marine Protected Areas (MPAs), can restore biodiversity and ecosystem function (Edgar et al. 2014) and directly benefit wellbeing by providing ecosystem services like blue carbon (marine carbon capture) (Bax et al. 2019, 2020; Gogarty et al. 2019) and coastal protection (BenDor 2015, Lau et al. 2019), as well as coastal livelihoods (McLeod et al. 2018; Sanderman et al. 2018). While such restoration activities are lagging behind in marine areas compared with land (Bayraktarov et al. 2015, France 2016, McLeod et al. 2018), examples do exist (see: Worthington and Spalding 2018; Valdez et al. 2020). Implementing such networks can provide some of the most straightforward means of helping restore and preserve ecosystems whilst protecting sustainable practices, livelihoods and cultures. However, resources are still required (e.g. enforcement) to realise the goals from such networks.

New Zealand

In the past there was limited recognition of traditional management practices and tools of Māori groups and stakeholders which played a key role in protecting natural resources. For example, conservation rāhui (temporary prohibitions) were enforced to protect the fertility of terrestrial and marine resources (McCormack 2011), and traditionally, rotational fishing has been used worldwide for abalone, corals, geoduck clams, sea urchins, scallop and sea cucumber species (Plaganyi et al. 2015). New Zealand has now developed legislation and regulations, which recognise and provide for Māori traditional management practices to contribute to protecting marine resources. Legislated customary tools, such as Temporary 186A and 186B closures (a form of rāhui), taiāpure (local management areas) and mātaitai (customary fishing reserves) based on traditional methods, are being established to create customary protected areas (CPAs) (Hepburn et al. 2019). These mechanisms recognise Māori practices and rights to participate in the management of the marine territory of respective groups, with the addition of compliance, monitoring and local community support, which traditional practices alone may not have had. This demonstrates the adaptability of New Zealand's management in protecting marine biodiversity using means which reflect societal values (Wheen and Ruru 2011).

Myanmar delta landscape

The Meinmahla Kyun Wildlife Sanctuary is classified as a no-take zone on paper, with multiple frameworks for priority protection of significant mangrove, crocodile, fishing cat, bat, crab and bird habitats, but they are weakly enforced and are in conflict with community livelihood needs. In order to balance these needs and biodiversity conservation, the Myanmar Landscape Management Plan provided a more adaptive approach to protecting critical biodiversity via mechanisms such as collaborative patrolling and small-scale income-generating activities (Macintosh 2016a, b; Yong 2016). Nevertheless, in this instance,

without a pathway which includes economic diversification in the landscape and effective law enforcement, pressure through illegal activities has not shifted away from the wildlife sanctuary.

Key recommendation

Contests for resources, especially diminishing resources has been a source of conflict throughout human history. Consequently, it is imperative to find means of protecting and maintaining the resources that can be implemented in a relatively straightforward way. While not a panacea (especially if implemented unwisely) MPAs based on different conservation targets can help conserve resources under pressure, thereby helping to reduce a source of conflict. Effective marine spatial management is an important part of a transformative and sustainable future (Duarte et al. 2020), especially if MPAs can be adapted to remain relevant as climate impacts the distribution of key systems and species (Brasier et al. 2021, Melbourne-Thomas et al., upcoming). Flexibility on the definition of an MPA in relation to marine biology considering temporal and spatial scale (e.g. seasonal closures linked to reproductive cycles), geographic region and people, along with adaptability for social and environmental conditions is imperative in this instance (Techera and Appadoo 2020). A shift away from the narrow focus of spatial planning units, towards spatial planning requirements that include additional mechanisms such as fiscal tools, ecological fiscal transfers, conditional cash transfers or universal income (Bregman 2017), among other payments for ecosystem services will be necessary to address the intrinsic value and need for conservation (Shapiro-Garza et al. 2020). Longer-term, linking the pay-off to the protected habitat may ultimately be a key motivator. For example, it has been estimated that the global monetary value of the benefits, or ecosystem services, provided by mangroves is $2.7 trillion USD annually (Sanderman et al. 2018). Local buy-in and support of vibrant and sustainable livelihoods that do not rely on illegal activities is an imperative aspect of this paradigm shift in conservation.

Action 4: Decision-making is equitable and based on ecosystem services

The planet cannot support consumerism and deliver fair and equitable livelihoods for all (Ripple et al 2017). With planetary boundaries near or exceeding their estimated limits (Häyhä et al. 2016), future global consumption levels need to be capped to levels less than those currently realised in the developed world for a fairer, broadly equitable distribution of resources (Agyeman 2010).

New Zealand

In New Zealand, many people are left behind while others prosper, or are left without the capacity for making some ethical (and often expensive) decisions about their daily lives. The New Zealand Wellbeing Budget 2019 and the New Zealand Living Standards Framework, created a pathway for applying indicators based on social and environmental well-being priorities, alongside economic ones, to measure success (Mintrom 2019; New Zealand Treasury Living Standards Framework). Current priorities are: improving mental health; reducing child poverty; addressing the inequalities faced by Māori and Pacific Islanders; thriving in a digital age; and transitioning to a low-emission, sustainable economy. These indicators better reflect traditional Māori practices and the concept of fair and equitable distribution of resources. An example of this is the overall value of hapū (community), Te-Whanau-a-Hikarukutai/Ngāti Horomoana, to 'respect the kahawai (*Arripis trutta*),' filtering down to human actions, such as the fishers only take the number of fish they need; no waste, and the fish are distributed amongst all fishers so everyone goes home with something (the 'tohatoha' principle) (Maxwell et al. 2018). This recognises kahawai as a gift from Tangaroa (one of the Māori deities of the ocean realm) for those who are most in need (the 'mo te iti me te rawa kore' principle), rather than being for sale. The fish are only caught during the austral summer and fishing is prohibited on Saturdays to remember a significant drowning event in the area which resulted in a five-year rāhui (prohibition on harvesting from the sea in commemoration of the lives lost). Access restrictions are promoted by local people as part of their roles as kaitiaki (reciprocal guardians of territorial areas). This involves educating everyone to fish

under the recreational limits, abide local practices and sustain the local food supply.

Myanmar delta landscape

Due to their socio-economic situation, the people living in villages in the landscape are not in a position to make similar ethical environmental choices as more economically privileged individuals. For many, their only livelihood option depends on extracting natural resources, despite awareness of the direct impacts their actions have towards depleting natural resources and increasing coastal erosion. These are predominantly landless people who have no option (e.g., finances, knowledge or access to community-land etc.) to engage in sustainable livelihoods to remove the pressure off their marine environment (Boutry et al. 2017). Rather than targeting conservation awareness raising campaigns at the local level, a combined approach needs to be provided that can lift people out of poverty and grant them the agency for moral decision-making.

Key recommendation

As mentioned above, food security and personal safety can be prime motivators for actions that can lead to conflict, especially when resources are scarce. In addition, a key human psychological driver is a sense of fairness (Brosnan and de Waal 2014), and supporting good resource use with equitable distribution diffuses multiple sources of conflict. This requires developing wealth distribution mechanisms that support sustainable use, conservation and management of coastal resources and recognising that nominally termed developing and developed nations will have different pathways to this end point. Individuals in richer nations need to constrain economic consumerism, reconceptualising it in terms of sufficiency within the planetary boundaries and in fulfillment of the SDGs. At the same time, responsibility and benefits need to be shared, and, adequately resourced and funded (Alexander et al., in review, this issue). Actions by marine managers such as kaitiaki (Ocean Guardians) (Makey and Awatere 2018; Peart 2019; Te Korowai 2012) show that such transitions can be done without crippling economic outcomes or degrading quality of life.

Action 5: Knowledge of the marine realm is strengthened—'mapping the ocean of life'

A prosperous but sustainable blue economy recognises diverse existing knowledge systems to increase evidence-based decision making to fully understand impacts and trade-offs. Equitable access to long-term global datasets will increase transparency and knowledge accessibility and lay the foundation for ongoing well-informed integrated co-management approaches (Linke and Bruckmeier 2016).

New Zealand

To address limitation issues (i.e. funding, Intellectual Property and data sovereignty) of research at a national scale the New Zealand Government asked the public where to invest its research, science and technology spending over a ten year period. This process recognised 11 challenges facing New Zealand and narrowed the focus of the resulting investment (MBIE 2014). The Sustainable Seas National Science Challenge (2015–2024) (Lewis 2018), aims to deliver on the vision of "healthy marine ecosystems that provide value for every New Zealander", by enhancing utilisation of resources within environmental and biological constraints (MBIE 2015). Across New Zealand's science investment, funding is allocated based on scientific excellence as well as demonstration of collaboration across science sectors (e.g. universities, crown research agencies, education systems), engagement with community (particularly the Maori community), and benefit and impact to society (MBIE 2015). This included developing co-funding opportunities for Māori and their marine industries.

Myanmar delta landscape

Myanmar, like many nations globally, is capacity constrained given the many demands on its budget and skills base (Yang 2020). Scientific research and development is not a main priority for Myanmar's government. Despite the existence of research pathways internally, only 0.03% of the Gross Domestic Product (GDP) is allocated to research and development (World Bank 2017), thus, science is dramatically under-resourced. This is a common issue globally at present (Brasier et al. 2020), and mechanisms to address this are severely needed (Waldron et al. 2013).

Global funding trusts—such as the UN and World Bank—with interest in the Myanmar Delta have a role in contributing support for science and development. This approach would also be beneficial to conserving marine connectivity between neighbouring countries in South East Asia (Bangladesh, India, Laos, Thailand) (Giffin et al. 2020). Particularly for long-term legacy collaborations across institutions to allow the compilation/accumulation and analysis of comprehensive data sets. Transforming the decision making pathways currently in place and using the data sets as a platform for policy making.

Key recommendation

Two important sources of conflict are (i) a feeling of deception or suspicion that arises when working in an information deficit (Samuelson and Zeckhauser 1988) and (ii) the unconscious assumption that everyone holds the same knowledge and understanding you do (and thus a disagreement is because they are being unreasonable not because they may have a different information base; Marks and Miller 1987). Access to a solid and transparent information basis, and the capacity to exchange information (potentially via dedicated knowledge brokers; Cvitanovic et al. 2015) can de-escalate both of these conflict triggers. With increasing global concern over the ability of our natural resources to provide sufficient ecosystem services that support human life (e.g. planetary boundaries), there is an increased need for global action and financing to support and understand the implications of future resource use. Linking capacity building and the provision of sustainable livelihoods is recommended– e.g. via collaborations across global knowledge networks such as, the Global Biodiversity Information Facility (GBIF www.gbif.org) and Future Earth (futureearth.org), but also potentially via alternative and distributed financial systems that recognise the ecosystem services provided by coastal marine systems and pay for the conservation and management of those services. To be transformative, collaborative actions must recognise the wealth of existing local and Indigenous knowledge (Webster et al. 2017, Shapiro-Garza et al. 2020), involve natural history museums (Arengo et al. 2017), and decadal funding projects such as the Census of Marine Life (www.coml.org) documenting global marine biodiversity, among other biodiversity initiatives (e.g., Distributed System of Scientific Collections www.dissco.eu and an alliance for biodiversity knowledge www.biodiversityinformatics.org) (Kaiser et al. 2013; Saucède et al. 2020) and work with university and knowledge-based institutions to identify the knowledge gaps that underpin trade-offs—especially between exploitation, conservation and cultural use and impacts on resources (Ward et al 2020). In developed countries, different knowledge systems can be integrated to support longer-term futures whereas in less developed countries (e.g. Myanmar), the immediate need (short term futures) of stakeholders requires a greater emphasis on positive economic activities.

Action 6: Interests of diverse user groups are balanced with a fair distribution of benefits

To balance conflicts of interests and power differentials among diverse groups, common values and priorities grounded in sustainable practices must be determined (Bennett et al. 2019; Laurent 2020). Effective mechanisms for benefit-sharing are desperately needed, and policies, such as Intellectual Property laws often neglect vulnerable groups (Swiderska 2009). Examples of such mechanisms include the Convention of Biological Diversity (www.cbd.int) and the access and benefit-sharing Clearing House within the Nagoya Protocol (Article 14) (Pemberthy and Saldarriaga 2020).

New Zealand

New Zealand Māori have received significant fisheries and forestry assets as a result of Treaty grievance settlements. While these assets may potentially experience economic losses as a result of New Zealand's current decarbonising initiatives, a new bill ensures Māori will have been consulted on the preparation of New Zealand's emissions reduction plan. This includes a Ministerial strategy on recognising and mitigating the impacts of reducing emissions on Māori. In preparing the national adaptation plan, the economic, social, health, environmental, ecological, and cultural effects of climate change on Māori were accounted for. This was not a straightforward process and barriers have arisen such as industry groups not wishing to share information resulting in penalties, or

conflicts of interest within self-governing pollution compliance schemes. Legislation enacted to address these obstructive issues includes: an oil spill recovery plan requirement, strategic planning around aquaculture management areas (AMAs), with resource consents, and a 20% allocation of AMA areas to Māori (New Zealand Ministry for the Environment 2019).

Myanmar delta landscape

Where good governance structures are lacking, equitable benefit sharing is nigh impossible, especially where there is a convoluted socio-economic-political context (Kenney-Lazar and Mark 2020), and because sovereignty isn't easily determined in the Myanmar Landscape due to factors such as recent migration to the area ($\sim$ 50 years ago), and the ramifications of Cyclone Nargis in 2008 (Zaw 2017)—many user groups remain marginalised and vulnerable. Gender and diversity inclusion are an important part of this conversation (De la Torre-Castro et al. 2017), and contradictory to the global norm (Britton 2010; Nash et al. 2019; Fagan and Teasdale 2020), universities in Myanmar have a long standing record of women holding higher-level positions in science (particularly biomedical see Htun et al. 2016 and Helbig et al. 2018). Thus, if properly resourced, there is potential for Myanmar to catalyse on the education of women, for example. On a national scale, democratic processes may be seen as a potentially beneficial future pathway, however, significant change would be required for countries like Myanmar to function as a fully working democracy by 2030 (Myint-U 2020) and even then strong inequity may remain (as evidenced by rates of inequality in the United States, seeing it have a poorer Gini score than Myanmar currently; World Bank, available from https://data.worldbank.org/indicator/SI.POV.GINI). Importantly, the determination process toward balancing the stakes of diverse users in the Myanmar Delta Landscape will require adequate financial support and resources, as well as an in-depth understanding of the many interactions, values and cumulative impacts in the landscape—a knowledge rich process.

Key recommendation

As noted above a lack of fairness can cause conflict. Consequently, distribution of benefits (not just resources) will be needed to reduce conflict and support sustainability. As the world faces uncertain futures with climate change post COVID-19 and increasing resource consumption to meet population demands, adaptive actions from global to community scales are needed. Many of these actions will come with costs and a re-thinking of the distribution of benefits and wealth generated through the societal use, management and conservation of these natural resources we all rely on. Specialists will need to be engaged to identify tools to overcome conflicts and build capacity for groups to be able to negotiate more equitable benefits. Such approaches should coincide with both recognition of the non-market values of coastal ecosystem services and access to them, as well as global schemes providing support for transitions to sustainable practices (for instance, paying communities and local governance structures for conservation of natural resources, such as ecological fiscal transfers, conditional cash transfers or universal income as suggested in other actions above).

Conclusion and key recommendation synthesis

Conflict will remain an ongoing and increasingly dominant dynamic as environmental and social pressures peak and economic imperatives dominate. This paper highlights that conflict resolution in different contexts can be used as a transformative energy to help forge the type of change needed, and to create new forms of social interaction and governance. An example is the marine management system for New Zealand which respectfully balances Māori guardianship and protection of the environment with Ecosystem Based Management (EBM) (Maxwell et al. 2020). However, what is possible in New Zealand, will not be immediately transferable to other coastal nations. The recommendations towards a sustainable future that we identified through the lens of our case studies highlights the need for place-based solutions, adapted to the conditions of each coastal community. For example, whilst the opening up of Myanmar following decades of military rule and isolation creates a unique opportunity for biodiversity conservation—the pace of resource extraction is rapid, and we must act constructively. The New Zealand case study points to strong sovereignty as a key mechanism that underpins secure economic access to sustainable livelihoods.

However, in the Myanmar Delta Landscape, where sovereignty is ill-defined, flexibility during the implementation of MPAs in relation to scale and people, along with adaptability is imperative.

These are global issues. By confronting issues of concern, such as illegal resource use and the economic structures that prohibit conservation, the possibility of achieving agreements on common ground can be facilitated via targeted financial support mechanisms. This type of resolution practice that directly addresses rather than steers away from contested issues, provides tools and financial incentives to support communities in shifting away from illegal resource extraction. To be globally transformative, these collaborative actions recognise the wealth of existing local and Indigenous knowledge and work with knowledge-based institutions. An approach that supports co-management with a recognition of bottom up processes, engagement, discussion and empowerment. Ours is a blue economy that includes wealth distribution mechanisms that support sustainable use, conservation and management of coastal resources. This is a vision that if adopted broadly and championed by the majority, will lead to profound changes over the next decade.

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