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## Policy Interactions In Large-Scale Marine Protected Areas

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## POLICY PERSPECTIVE

## Policy interactions in large-scale marine protected areas

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## Abstract

Large-scale marine protected areas (LSMPAs) have proliferated in recent years, now accounting for most of the world's MPA coverage. However, little is known about LSMPA outcomes and the factors that affect them. Here we argue that policy interactions—the cumulative effect of co-existing policies for an issue and/or geographical area—can play a critical, but under-recognized, role in influencing LSMPA design and outcomes. We analyze interactions between national LSMPAs within Palau and Kiribati, and regional fisheries management established by the Nauru Agreement to show how policy actors can account for policy interactions in LSMPA design, and to demonstrate the profound influence that policy interactions can have on the economic and conservation outcomes of LSMPAs. We draw on our analysis to distill lessons for our case studies and LSMPAs globally. We emphasize that policy interactions are dynamic and malleable: they should be proactively managed to stimulate synergy and address conflict. Understanding and managing policy interactions is complex and context-specific, requiring dedicated resources, cross-sectoral coordination, and sophisticated scientific and practical policy expertise. To avoid undesirable consequences and capitalize

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on opportunities to secure multiple benefits, we recommend that policy actors systematically evaluate, monitor, and adapt to policy interactions throughout LSMPA design and implementation.

#### KEYWORDS

fisheries management, Kiribati, large-scale marine protected areas, marine conservation, Nauru Agreement, Pacific Islands, Palau, Palau National Marine Sanctuary, Phoenix Islands Protected Area, policy interactions

## 1 | INTRODUCTION

The Western and Central Pacific Ocean encompasses the world's largest tuna fisheries. In 2017, they were worth US\$5.84 billion in landed value and accounted for 54% of the global tuna catch (Williams & Reid, 2018). The majority of the catch is taken within the national jurisdictions of Pacific Island countries (PICs) by licensed foreign fishing fleets (Hanich, 2012). While resource endowments vary among countries, license fees from tuna fisheries are critical for government revenues across the region (Gillette, 2016). Recently, some PICs have designated large-scale marine protected areas (LSMPAs) greater than 100,000 km<sup>2</sup> (Friedlander et al., 2016), many of which prohibit commercial fishing. No-take LSMPAs may seem paradoxical to PICs' objectives of re-asserting control over their ocean territories to capture greater returns from tuna fishing dominated by foreign firms (Silver et al., 2015). However, for two PICs with LSMPAs in the Western and Central Pacific Ocean—Palau and Kiribati—policy interactions make these conservation and development objectives more compatible than they may otherwise seem.

Policy interactions are the cumulative effects of coexisting policies for an issue and/or geographical area. Interactions among policies at the same jurisdictional level or across levels shape social and environmental outcomes (Young, 2002). Policies may interact synergistically or in tension; the type of interaction and its consequences vary by context (Young, 2002). Policy interactions warrant special attention in LSMPAs (Gruby et al., 2016). Due to their extensive size, LSMPAs tend to interact with national and international politics and policies in ways not typically seen in smaller MPAs closer to shore, leading to unique and sometimes unexpected outcomes (Gruby et al., 2017). For example, policies regarding high seas conservation, human rights, and territorial sovereignty intersected in unexpected ways with LSMPA processes in Bermuda, Rapa Nui (Easter Island), and the Commonwealth of the Northern Marianas Islands, respectively, significantly influencing their outcomes (Gruby et al., 2017). It cannot be assumed that sector-based government agencies

or conservation-focused practitioners are systematically accounting for or proactively managing the full suite of policies that may meaningfully interact with LSMPAs and substantially affect their outcomes (Rice et al., 2012). Policy interactions are under-studied and under-recognized—but critical—in the global LSMPA movement (Gruby et al., 2016).

Where national LSMPAs overlap with tuna fisheries in the Pacific, they interact with a pre-existing policy framework for regional tuna management. Here we empirically explore policy interactions between LSMPAs in Palau (the Palau National Marine Sanctuary, PNMS) and Kiribati (the Phoenix Islands Protected Area, PIPA) and a regional fisheries management framework established by the Parties to the Nauru Agreement for purse seine tuna fishing known as the Vessel Day Scheme (hereafter: VDS). We focus on the consequences of policy interactions for the design of the PNMS and outcomes of both LSMPAs. Our selected case studies are instructive for several reasons. First, PIPA is one of the longest-established LSMPAs in the world, with a high global profile; the nascent LSMPA movement looks to PIPA for experience and lessons learned. Second, the case studies themselves are of global interest in that they consider outcomes of policy interactions for tuna conservation in a globally significant fishery. Third, the case study approach is analytically powerful in allowing us to explore how the same international policy interacts distinctly with two national LSMPAs, revealing the importance of context and actor agency in shaping policy interactions. We draw on the experiences in Palau and Kiribati to raise the profile of policy interactions in the LSMPA movement, and to distill lessons relevant for our case studies and LSMPAs globally regarding the importance, dynamics, malleability, and complexity of policy interactions.

The article proceeds as follows: first, we describe objectives of the VDS and LSMPAs. Then, we explain how Palau strategically accounted for policy interactions in the design phase of the PNMS to maintain its economic benefits from the VDS. Next, we discuss how the policy interactions affect outcomes of the LSMPAs related to tuna fisheries revenue, foreign compensation (in Kiribati), and tuna

conservation before summarizing our recommendations for LSMPAs globally. Our analysis is informed by the authors' regional experience with LSMPAs and fisheries policy, and primary data collected<sup>1</sup> in Kiribati (2016) and Palau (2015–2017). Data sources include policy documents plus 47 interviews in Kiribati and 84 in Palau.

## 2 | REGIONAL TUNA MANAGEMENT

Since 1982, eight PICs, including Palau and Kiribati, have used a cooperative approach to fisheries management through the Nauru Agreement. The Parties to the Nauru Agreement<sup>2</sup> (PNA) control ~25% of global tuna catch, including ~50% of global skipjack (Bernadett, 2014). The PNA's most impactful fisheries management tool is the VDS, implemented in 2007. Palau and Kiribati joined the scheme in 2010 and 2012, respectively.

The VDS sets an annual total allowable effort (TAE): the number of days that fishing vessels may fish within PNA Exclusive Economic Zones (EEZs). Each country is allocated a Party Allowable Effort (PAE), a share of the TAE. The PAE is determined through a flexible formula based on historical catch and distribution of biomass in EEZs (Aqorau, 2009). By limiting fishing days, the PNA seeks to enhance sustainability while creating a scarcity value for licenses (Havice, 2013). The PNA have further increased the value of vessel days by agreeing to a minimum price (Bernadett, 2014) and permitting members to buy and sell (called "trading") portions of their PAE among one another. Vessels must fish their days in the EEZ of the country from which they purchased them.<sup>3</sup> The VDS has dramatically increased licensing fee revenue and negotiating power of small states with foreign fishing nations and fleets (Havice, 2013; Yeeting et al., 2016) while stabilizing revenue that otherwise fluctuates with regional fishing patterns (Hanich et al., 2018).

## 3 | LARGE-SCALE MPAs IN PALAU AND KIRIBATI

The PNMS (est. 2015) prohibits fishing in 80% of Palau's national waters as of 2020, and PIPA (est. 2008) has prohibited fishing in 11% of Kiribati's waters since 2015<sup>4</sup> (see

Figure 1). Objectives for both LSMPAs include marine habitat and biodiversity conservation; food security; and sustainable economic development through tourism, international aid, and, in Palau, a domestic tuna fishery. Both countries also hope the LSMPAs can contribute to tuna management by protecting sites important for spawning or juveniles. Sovereignty is another important consideration: LSMPAs aim to enhance surveillance and control of EEZs. We take shared interests of the LSMPAs and VDS in sustainable economic development and tuna conservation as a point of departure for exploring how the policy interactions affect the design of the PNMS and outcomes of both LSMPAs.

## 4 | POLICY INTERACTIONS IN LARGE-SCALE MPA DESIGN

Kiribati established PIPA in 2008 before joining the VDS in 2012, and its design therefore did not account for this specific policy interaction (it did consider impacts on fishing revenue, discussed below). In contrast, the VDS played an important role in the design of the PNMS (see Figure 2 for a timeline).

In February 2014, Palau's president announced plans for an LSMPA that would ban commercial fishing throughout Palau's EEZ. This raised questions within Palau, including how a full EEZ closure could affect Palau's participation in the VDS. About 6 months before the PNMS was legally designated, the PNA CEO told the Palauan congress that "Palau cannot declare its EEZ a moratorium, ban commercial purse seining, and still be allowed to trade its [VDS] days" (Letter from Transform Aqorau; April 19, 2015).

Though Palau's economy relies primarily on tourism (Wabnitz et al., 2018), revenue from foreign fishing is also important, accounting for 12% of total government revenue from 2014 to 2017 (PICRC & COS, 2019). The sale of foreign fishing licenses is a particularly important source of consistent revenue for Palau's 16 states (RPPL No. 9–49 Subchapter IV, Section 177). The bulk of Palau's fishing revenue comes through the VDS (PICRC and COS, 2019), mostly earned by selling its days to other PNA members. In 2016, Palau's VDS allocation was worth \$5.3 million (RoP, 2017). The potential loss of revenue from VDS trading was an economic and political concern in the PNMS designation process: the congress needed buy-in from state delegates to pass the PNMS legislation.

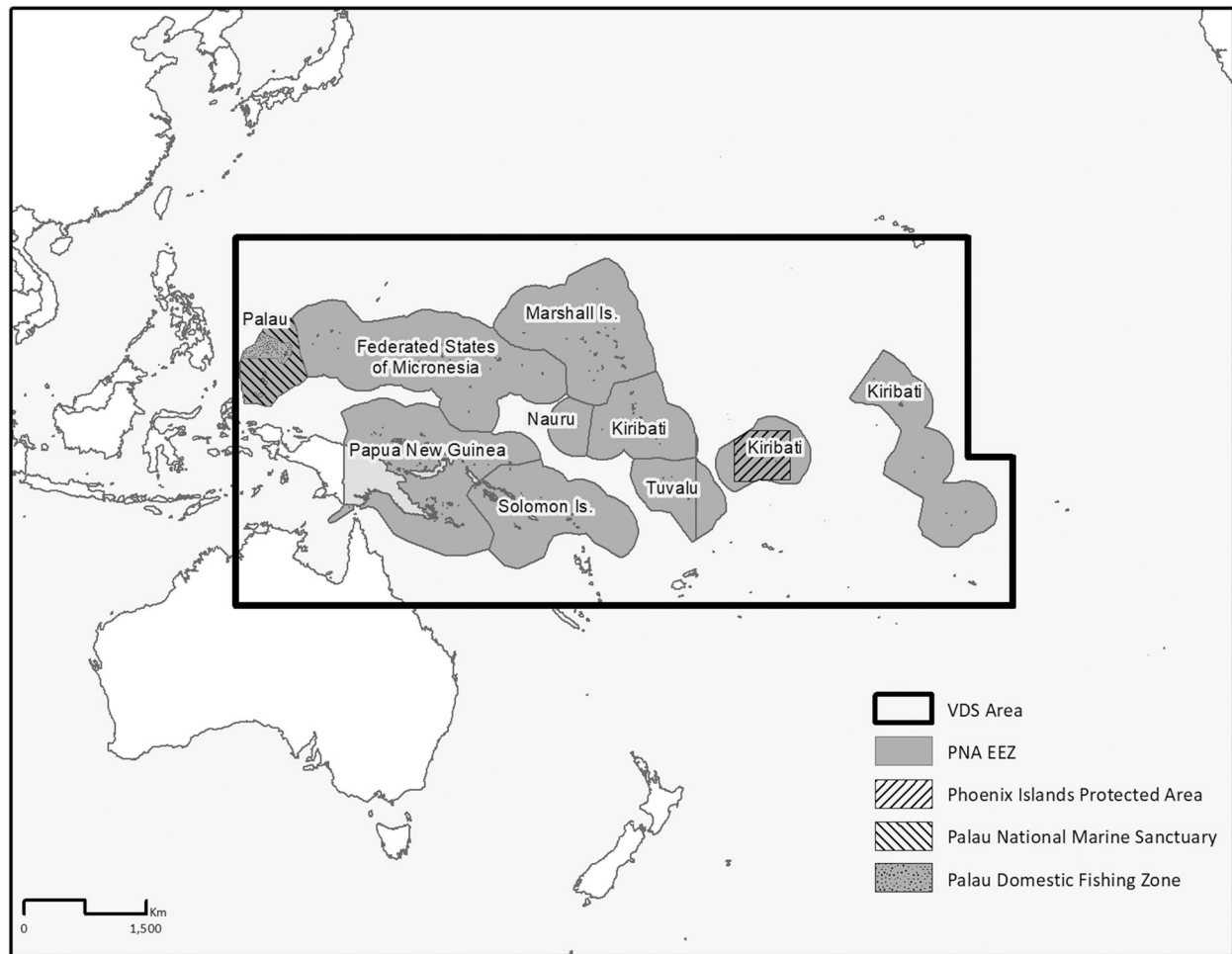
These concerns, among other considerations, prompted officials to design the PNMS so Palau could satisfy the PNA and maintain their VDS allocations, while pursuing additional objectives linked to an LSMPA. Local and foreign experts as well as conservation NGOs were also involved in the PNMS design process, including the Pew

<sup>1</sup> By a team led by Gruby, Gray, and Campbell.

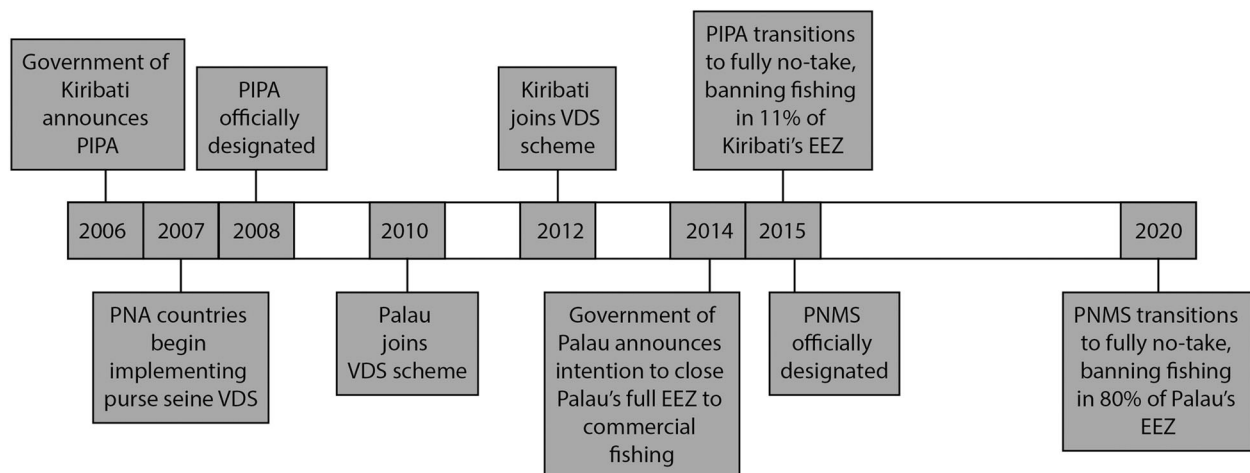
<sup>2</sup> Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands, and Tuvalu.

<sup>3</sup> Exceptions to this include days purchased under the FSM Arrangement that allows regional access, and historically, US Treaty fishing days (Havice, 2013, 2018).

<sup>4</sup> Subsistence fishing is allowed around one inhabited island (0.6% of LSMPA).



**FIGURE 1** Map depicting spatial overlap in VDS management area and LSMPs in Palau and Kiribati. Regarding the VDS area, fishing days may be used only inside of PNA EEZs. Other PNA regulatory measures (such as high seas fishing closures) have been applied within the broader VDS Area; however, the VDS and other PNA-related measures are not applied inside of non-PNA EEZs



**FIGURE 2** Timeline of key events relating to the VDS and LSMPs in Palau and Kiribati



Charitable Trusts, Friends of the Palau National Marine Sanctuary, and The Nature Conservancy. Various options were considered. Ultimately, initial aspirations for a full EEZ closure were reduced to 80%. The remaining 20% was designated as a domestic fishing zone (DFZ) that required fish to be landed in Palau and sold domestically; exports were banned except for purse seine catch taken on free-schools—an environmentally selective technique.<sup>5</sup> In July 2015, three months before the PNMS was legally designated, the presidents of Palau and two other PNA countries sent a letter to fellow PNA members requesting “respect” and “endorsement” of the PNMS and expressing Palau’s “desire to maintain its PAE and continue to trade its allocation with our PNA members.” The presidents argued that the PNMS would not undermine the value of the VDS and “will provide significant conservation benefits for regional tuna conservation goals [...] through the protection of juvenile tuna and associated/dependent species.” Palauan officials we interviewed said that the PNA supported their continued allocation of vessel days. In summary, the interaction between the PNMS and VDS began during the design phase of the PNMS, prompting a more complex LSMPA design that enables Palau to remain a beneficiary in the Western Pacific tuna fishery.

## 5 | ECONOMIC OUTCOMES

The VDS helps offset fishing revenue losses from PNMS and PIPA by allowing Palau and Kiribati to maintain and trade their PAE days. At the time of this research, Palau continues to sell the majority of its PAE to other PNA countries. The Palauan EEZ has never been a highly attractive fishing ground for purse seiners and is less so since full implementation of the PNMS; the historically limited purse seine fishing in Palau has since dwindled to zero. Under the current PAE allocation formula, Palau’s PAE is likely to decrease only slightly over time, because very little of Palau’s allocation is based on fishing history; most has come from the biomass provision of the formula. Future revenue will be determined by a number of factors, including the TAE across the PNA, value of vessel days, and tuna biomass in Palau’s waters. But under the current agreement, Palau continues to trade its PAE, retaining most of its current vessel day allocation and revenue, despite closing 80% of its EEZ to fishing and having no domestic purse

seine fishing. To further offset any reductions in tuna revenue and fund PNMS implementation, Palau has increased visitor fees, fish export taxes, and attracted foreign aid.<sup>6</sup>

In Kiribati, the value of the VDS as an offset to economic losses associated with PIPA is complicated by the initial agreement to establish PIPA. Unlike Palau, Kiribati’s economy relies primarily on the sale of tuna licenses to foreign fleets (GoK 2016 Budget). Kiribati waters recorded the largest tuna catch among Pacific fishing nations every year from 2014 to 2018 (Reid, 2019). Thus, the economic impact of an LSMPA in 11% of the EEZ was a critical question in the development of PIPA, pre-VDS. Government representatives originally insisted that a no-take area was impossible unless foreign nongovernmental partners<sup>7</sup> could offset costs associated with protection.

As a result, the Government of Kiribati signed a conservation contract with Conservation International and the New England Aquarium, establishing The Phoenix Islands Protected Area Conservation Trust Fund (PIPA Trust). The contract obligated the partners to fund PIPA management and to study potential revenue losses from fishing prohibitions, in order to inform compensation decisions (Shelley, 2012). The PIPA Trust Act (2009) stipulates that the Trust may compensate the government if there is revenue loss associated with PIPA, to the extent agreed upon between the Trust and government. A subsequent agreement in 2014 established a tuna working group to assess the costs (and/or benefits) of PIPA’s full closure in 2015 (Rotjan et al., 2014). As Shelley (2012, p. 515) notes, “it will be difficult to settle on a number that is acceptable to everyone.”

Part of the difficulty in assessing economic loss arises because the conservation contract was negotiated before the implementation of the VDS. PIPA was first announced in 2006. In 2008, the year PIPA was established, government revenue from the sale of fishing licenses was \$27.5 million USD (GoK 2016). Kiribati joined the VDS in 2012, and by 2015, those revenues grew to a record \$148.8 million USD. Total catch in 2015 nearly matched the previous year and was higher than the annual total catch from 2006 to 2013, despite it being the first year of the PIPA closure (GoK, 2016). Although there has been a modest

<sup>5</sup> To ensure the viability of the fishing industry and continued supply of pelagic fish in Palau, the regulations have since been amended to change the location and zoning of the DFZ; allow exports for longline vessels; provide for exemptions to the landing requirement; and exempt companies from paying export taxes on fish caught outside of Palau that are domestically landed for commercial export.

<sup>6</sup> As of 2016, the PNMS received funding from TNC, Italy, Prince Albert of Monaco Foundation, Shin Kong Hospital totaling \$249,812; and commitments from Oceans 5 of \$850,000 and Taiwan of \$1 million. Support for marine surveillance comes primarily from the United States, Japan, and Australia, including a commitment from The Sasakawa Peace Foundation and Nippon Foundation valued at about \$50 million (PNMS Annual Report, 2016).

<sup>7</sup> Conservation International and New England Aquarium were founding NGO partners; each organization is named in the 2009 PIPA Conservation Trust Act. Subsequently, Oceans 5, the Waitt Foundation, and the Aquarium of the Pacific became involved through either providing funding support, and/or joining the board of the PIPA Trust.

reduction in vessel-days and revenues in Kiribati since its peak in 2015 during an El Niño fishing surge,<sup>8</sup> the relative reduction in revenue is smaller than the decrease in vessel days, with modeling suggesting that VDS trading is offsetting revenue losses (Villaseñor-Derbez, Lynham, & Costello, 2020)

These dynamics will affect decisions about compensation via the PIPA Trust. The VDS fundamentally changed the context for the pre-existing conservation contract. If Kiribati continues to sell its full allotment of VDS days, it may be difficult to argue that PIPA has resulted in economic losses unless it can be demonstrated that PIPA has reduced the value or demand for access to Kiribati's EEZ. However, regardless of whether losses are incurred, there is a perception among i-Kiribati officials that compensation and/or other economic benefits from PIPA should be forthcoming as originally suggested (Mitchell, 2017). Many interviewees in Kiribati believe that PIPA has benefited foreign NGO partners more than the people of Kiribati by fulfilling a foreign conservation agenda and supporting the careers of foreign scientists and conservationists (Mitchell, 2017). If the policy interactions contribute to an actual or perceived loss of compensation, it could affect political support for PIPA in Kiribati.

## 6 | TUNA CONSERVATION OUTCOMES

The geography of fishing displacement by LSMPAs and spatial ecology of tuna will shape the consequences of the policy interactions for tuna conservation. Tuna are highly mobile and capable of long-distance travel (Bucaram et al., 2018). The interactions may be synergistic if the LSMPAs are protecting sites that are ecologically important for tuna. Spawning (pers. obs.) and nursery habitats (Filous et al., 2020) of yellowfin tuna have been documented within Palau's EEZ. This supports Palau's claim that regional tuna stocks may benefit from the PNMS. Kiribati's claim that PIPA provides some protection for spawning has been confirmed (Hernández et al., 2019). However, tuna are known to spawn across their ranges and more research is needed to understand the importance of spatially fixed LSMPAs for tuna (Bucaram et al., 2018; Koido & Suzuki, 1989).

Alternatively, the policy interactions are less beneficial to tuna conservation if measured by reduced regional fishing effort. In Palau, the interaction should maintain the status quo of little to no commercial purse seine fishing within Palau's EEZ, and continued fishing of most of Palau's PAE in other PNA EEZs. In Kiribati, Villaseñor-

Derbez et al. (2020) created a model that partly replicated PNA conditions and suggested that vessels displaced from PIPA have shifted to other PNA member waters. Displacement is also possible within Kiribati's large EEZ. Critics fault LSMPAs for displacing, rather than reducing, fishing effort (Hilborn, 2018), illustrating that this is not a problem specific to the PNMS or PIPA, or to its interactions with the VDS. However, while neither PIPA or PNMS necessarily intended to reduce fishing effort, the VDS arguably makes fishing displacement easier through regional trading, and more likely due to the value of the fishery.

## 7 | LESSONS FOR THE GLOBAL LARGE-SCALE MPA MOVEMENT

We draw conclusions relevant for our case studies and LSMPAs generally. It is not a given that LSMPA advocates, managers, and other relevant policy actors are adequately accounting for policy interactions. The first globally relevant lesson from this analysis is, therefore, that policy interactions can significantly influence the design and outcomes of LSMPAs, and in context-specific ways. Palau accounted for the VDS in designing the PNMS and, as a result, maintains most of its fisheries revenue while closing 80% of its EEZ to fishing. The VDS also helps offset economic losses of PIPA, although the profitability of the VDS, which was implemented *after* the PIPA conservation contract, could curtail expected revenue gains from compensation via the PIPA Trust. Impacts of policy interactions for the LSMPAs' tuna conservation goals are less clear. The spatially flexible management of the VDS enables fishing displacement both regionally and nationally. The policy interactions are therefore unlikely to reduce fishing effort below the regional TAE. However, the tuna conservation benefits of LSMPAs may depend not on the quantity of fishing, but where it takes place. The LSMPAs and VDS may be complementary to the extent that the VDS helps make large-scale conservation economically and politically feasible *and* the LSMPAs enhance the sustainability of the fishery by protecting ecologically significant areas. More research is needed on PIPA and PNMS tuna conservation outcomes at multiple scales.

More generally, we find that the policy interaction broadens conservation and development opportunities for Palau and Kiribati because it enables them to pursue a new suite of objectives tied to their LSMPAs—for example, food security, biodiversity and tuna conservation, tourism, domestic fishery development, enhanced sovereignty—without sacrificing benefits derived from fisheries. Whether they achieve their objectives remains to be seen, but these findings challenge simple narratives

<sup>8</sup> Pacific fishing surges occur at irregular intervals (e.g., in 1994, 1997, 2002, and 2009), consistent with El Niño Southern Oscillation patterns (Hanich et al., 2018; Lehodey, Bertignac, Hampton, Lewis, & Picaut, 1997).



of PICs as passive victims of ocean grabbing.<sup>9</sup> In some respects, the LSMPA and VDS policies may reflect Pacific states exercising and strengthening sovereignty to claim benefits of their resources that have long been exploited by foreign fishing firms. However, LSMPAs in Kiribati and Palau have been supported in part by foreign NGOs, and there is a need to better understand what this kind of “articulated sovereignty” (Lunstrum, 2013) implies for state and nonstate authority over ocean spaces and resources (Campbell et al., 2016). Nonetheless, the experience of Palau and Kiribati further illustrate how small island (large ocean) states can leverage contemporary interest in oceans as a conservation and development frontier to their advantage (Silver & Campbell, 2018). What these findings demonstrate for LSMPAs more generally is that analyzing policy interactions is key to understanding the complex outcomes of LSMPAs and the agency of individual states in shaping them.

The second globally relevant lesson from this analysis is that policy interactions affecting LSMPAs are dynamic and malleable: they can be adjusted to stimulate synergy and address conflict. In Palau, the significance of the LSMPA/VDS interaction emerged after the President publicly announced his intention for a full EEZ closure. In dialogue with the PNA, and with the support of conservation NGOs and experts, Palau strategically adapted its initial vision to avoid conflict with the VDS. There is also opportunity to manage interactions that may emerge after LSMPA designation. In Kiribati, the policy interaction arose years after PIPA was designated. It will be critical that the PIPA Trust further develop and clearly demonstrate benefits for the people of Kiribati in order to maintain political support for PIPA. The PIPA Trust could proactively mitigate political conflict by providing compensation regardless of how the VDS affects economic costs of PIPA. More broadly, if NGOs wish to help reduce regional fishing effort rather than displace it, they could purchase portions of Palau’s and Kiribati’s PAE, an option supported by PNA representatives and Palauan officials (Gruby et al., 2017). Policies in other sectors, too, may be designed to account for LSMPAs. The PNA, for instance, could factor demonstrated regional-scale conservation benefits into the calculation of PAEs to reward countries that undertake conservation efforts to benefit the region. Even more broadly, global actors must ensure that conservation initiatives are compatible across high seas and EEZs to avoid applying a disproportionate conservation burden on coastal states. Our key message for LSMPAs globally is that dynamic policy interactions need

to be monitored and adaptively managed at all stages of design and implementation.

The third globally relevant lesson from the case study is that understanding policy interactions is complex. Dedicated resources, deliberate and proactive cross-sectoral dialogue and coordination within and across governments, and sophisticated scientific and practical policy expertise is necessary to understand and manage the full suite of relevant policy interactions for LSMPAs. To illustrate this point, we highlight the narrowly scoped focus of our analysis: we focus exclusively on how the VDS differentially affects certain economic and tuna conservation outcomes of PIPA and PNMS. However, even within the fisheries sector, there are many other relevant policies (e.g., other multilateral fishing agreements) and outcomes (e.g., on the full range of affected fisheries and habitats) that we do not consider. Additionally, we don’t assess outcomes for PNA objectives beyond tuna conservation. For instance, do the LSMPAs affect the value of vessel days? What would it mean for the PNA if additional member states implement LSMPAs?

To avoid undesirable unintended consequences, and capitalize on opportunities to secure multiple benefits, we recommend that policy actors conduct a strategic policy analysis during the design phase of an LSMPA. The analysis should cast a broad net and follow a transparent process for examining the potential direct and indirect interactions of conservation, fisheries, development, human rights, territorial sovereignty, and other potentially relevant policies at all scales. A systems perspective, mixing creativity with deep policy experience and knowledge of local context, should help uncover potential interactions that can inform LSMPA design. However, policy interactions are not always predictable; new policy interactions may emerge after a LSMPA is designated or may only become obvious during implementation. There is therefore a need for ongoing monitoring and policy evaluation to guide an adaptive approach to LSMPA governance that attends to dynamic policy interactions. This is especially true where LSMPAs interact with regional or international policies that are outside of a given jurisdiction’s direct control. In ongoing analyses, it will be critical to assess policy interactions that are perceived or expected alongside those that are realized, as both the interactions and perceptions about them need to be managed to maintain political support for the LSMPAs in the long term.

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<sup>9</sup> Some scholars have raised concerns that LSMPAs may represent “ocean grabs” that disempower governments, dispossess resource users, and facilitate accumulation by foreign conservation actors (e.g., Mallin, Stolz, Thompson, & Barbesgaard, 2019).

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## AUTHOR CONTRIBUTIONS

RG, NG, LC, and QH designed and conceptualized the study. RG, LC, NG, and LM led data collection, with additional contributions from QH, KO, KS, and AF. RG, NG, LM, LF, and QH led data analysis. RG led article writing, and NG, LF, QH, EH, KO contributed text. All coauthors provided intellectual contributions through critical revisions.

## ETHICS STATEMENT

This research has been approved by the Colorado State University Institutional Review Board for the protection of human subjects (protocol number: 14-55508 H).

## DATA AVAILABILITY STATEMENT

Per our IRB protocol, data is protected as confidential.

## CONFLICT OF INTEREST

QH provided technical advice to the Government of Palau, and to the PIPA Trust, between 2014 and June 2019. As an employee of the Ministry of Natural Resources, Environment and Tourism in Palau, KS is involved in the design and implementation of policies discussed in this article.

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