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Sinking Islands, Drowned Logic; Climate Change and Community-Based Adaptation Discourses in Solomon Islands

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Received: 16 July 2020; Accepted: 30 August 2020; Published: 3 September 2020

Abstract: The saltwater people of Solomon Islands are often portrayed to be at the frontline of climate change. In media, policy, and development discourses, the erosion and abandonment of the small, man-made islands along the coast of Malaita is attributed to climate change induced sea-level rise. This paper investigates this sinking islands narrative, and argues that a narrow focus on the projected impacts of climate change distracts attention and resources from more pressing environmental and development problems that are threatening rural livelihoods.

Keywords: policy narratives; resilience; climate finance; rural development; indigenous peoples; media; participation; development projects; Pacific; Malaita

1. Introduction

"Sinking islands". With this alarmist headline, the Malaita Star, a popular magazine in Solomon Islands, draws attention to the impact of climate change on the saltwater people of Malaita (see Figure 1). These wane asi, literally people of the sea, live on small islands constructed from coral rocks. In the media, the wane asi are consistently portrayed as the first victims of climate change: the proverbial canaries in the coal mine. For instance, in an opinion article in the Solomon Star in 2016, the nation's leading newspaper, Reverend Philemon Akao [1] highlights the vulnerability of the saltwater people:

> *"As if we were enticed by a dream, the rising sea level is a reality unjustly struck at the very core of my people's sanity. It denies our dignity to live just as it destroyed our vulnerable homes and left us homeless. Once my people were warriors, now we're but a displaced uprooted people. Along our beautiful Lau lagoon, human made islands are washed, destroyed to their cores, uninhabited, deserted and ruined by Mother Nature. Unlike the frigate birds in the sky forced by the high tide and return when the tide is low, my people are uprooted and flogged unjustly by the effects of climate change and never to return to where they once lived. (…) In the midst of climate change, a time death is what we see every day in the suffering of people and victims living without hope for the future, who among us is prepared to offer the uprooted and displaced people a place to live?"*

Figure 1. The sinking islands of Malaita (Malaita Star, 2016, 2017).

Similar claims are regularly made in science, policy, and development discourses. There is broad scientific consensus that people on low-lying islands in the Pacific are highly vulnerable to future climate-induced sea-level rise, and that there is an urgent need to invest in adaptation mechanisms [2,3]. But little is known about how local people in remote rural areas, such as Malaita, perceive and deal with climate change [4,5]. Rebecca Monson and Joseph Foukona [6] write in an edited volume on climate displacement that the wane asi in Lau Lagoon increasingly have to cope with changing wind patterns, extreme weather events, and coastal erosion:

> *"The people of Lau have experienced unusually high tides on several occasions. High tides have washed through the villages, destroying kitchens that are built directly on the ground of the islands; flooding houses; and carrying refuse from the toilets that surround the islands. Some islanders are now attempting to relocate to the mainland but most wish to remain on their islands."*

James Asugeni et al. [7] report that the inhabitants of six artificial islands in East Malaita are deeply concerned about climate change, and contemplate moving to higher ground. And John Walenenea [8] documents the loss of freshwater wells in Langalanga Lagoon due to saltwater intrusion caused by a rising sea-level.

In the National Adaptation Programs of Action (NAPA), the Ministry of Environment, Climate Change, Disaster Management, and Meteorology (MECDM) identifies the wane asi as: "being the most vulnerable to climate change (…) many of these communities and/or villages live on or at the edge of the sea and are often subject to impacts of storms, storm surge, sea-level rise, drought, saltwater intrusion, and flooding" [9]. Several civil society organizations have also highlighted the plight of the wane asi. The Climate Displacement Land Initiative, for example, witnessed that: "increasing numbers of these islands are now beginning to lay uninhabited as residents leave behind destroyed homes and flee the ever-worsening consequences of climate-change" [10]. In the same way, the Community Conservation Resilience Initiative [11] conducted participatory resilience assessments on two man-made islands in Lau Lagoon, and concluded that:

> *"Sea level rise is a major external threat that impacts (…) communities throughout the Solomon Islands. It is one of the biggest challenges in both the short- and long-term and is forcing the communities to consider measures as drastic as relocating to the mainland in Malaita."*

A clear narrative emerges from these newspaper articles, scientific publications, and policy documents: (1) The rising sea-level is flooding the artificial islands and forcing the wane asi to relocate to higher grounds; (2) tropical cyclones are destroying sea walls and houses; (3) saltwater intrusion is contaminating freshwater sources; (4) higher sea water temperatures and ocean acidification are degrading coral reefs and depleting coastal fisheries; (5) changing rainfall patterns are negatively affecting agricultural productivity and exacerbating food insecurity; and (6) substantial climate finance and development aid is therefore needed to enable the wane asi to adapt to these changes.

This paper investigates this sinking islands narrative and questions whether the socio-ecological changes on the artificial islands of Malaita can be solely attributed to climate change. It notices a significant mismatch between the climate change discourse manifested in the media, policy, and so-called Climate Change and Disaster Risk Management (CCDRM) projects, and the everyday realities and problems of people on Malaita [12–14]. This paper argues that a narrow focus on the impacts of climate change distracts attention and resources from other, more pressing problems that are threatening rural livelihoods and are eroding people's capacity to adapt to rapid environmental change [15,16].

2. Background: The Saltwater People of Malaita

The distinction between wane asi (saltwater people or to'aiasi) and wane tolo (forest people or to'aitolo) is a salient feature of human ecology in Melanesia [17,18]. The wane asi are fishers who barter fish for root crops and vegetables with the wane tolo, shifting cultivators who inhabit the forested interior of Malaita (see Figure 2). This distinction is not absolute. Nowadays, many wane asi maintain agricultural plots and many wane tolo are fishing, and intermarriage is common [19]. Nonetheless, many communities continue to identify themselves as wane asi: The livelihoods, worldview, and identity of these people revolve around fishing and the sea.

Little is known about the origins of the "island builders of the Pacific" [20]. Oral history recounts that the first artificial islands were constructed in the 16th century by people from the uplands of Malaita fleeing from war, sorcery, or famine [21]. It has also been postulated that the island settlements were an adaptation to endemic malaria in the lowlands [22]. In any case, a vibrant culture developed in the lagoons and mangrove forests of Malaita. The most important ethnic groups are the Lau, on the northeast coast, and the Langalanga, on the west coast.

Figure 2. Women barter fish for root crops in Lau Lagoon (J. van der Ploeg 2017).

2.1. The Lau

Lau Lagoon extends for approximately 35 km on the northeast coast of Malaita. The shallow lagoon harbors a rich diversity of coral reefs, seagrass meadows, and mangrove forests. There are approximately 94 artificial islands in the lagoon [23]. Several more artificial islands are located in neighboring Suava Bay. These settlements are built by manually hauling and piling up coral rocks on shallow reefs [24]. Small new extensions are constructed for new households. As a result, some islands form a maze of small raised platforms connected by narrow bridges. Some of these man-made islands, such as Sulufou, Funafou, Foueda, and Tauba, are relatively large (>1 ha), and are densely populated. Others are very small (<100 m^2). Some islands are built as extensions of natural islands or rock outcrops in the lagoon. Others are constructed in the mangroves by constructing coral rock walls, often more than 3 m high, and filling the enclosure with gravel and sand. In most cases, these

islets are just above the high-water mark (<30 cm), and most houses are constructed on stilts (see Figure 3).

Figure 3. Funafou Island in Lau Lagoon (J. van der Ploeg, 2015).

Fishing forms the basis of people's livelihoods in the lagoon, and the Lau have an in-depth knowledge of their marine environment [25]. A great variety of fishing methods is used. Fish, crabs, marine turtles, and a variety of shells are bartered for root crops and vegetables with Baegu and Baelelea farmers from the uplands [26]. A complex tenure system regulates access to and use of marine resources in the lagoon. Coral reefs and deep pools are generally claimed by patrilineal clans, locally referred to as tribes [27]. In principle, land and sea rights are exclusionary, but in practice other clans often have usufruct rights. Seagrass meadows and the deep sea are de-facto open access. Traditionally, the Lau have managed their fisheries by imposing temporal closures for certain reefs [28].

In the 19th century, there were virtually no settlements along the coast of Malaita, with the exception of the artificial islands of the wane asi [21]. During the colonial period, wane tolo moved from their small, scattered hamlets in the uplands to large, permanent villages in the coastal areas [6]. Many wane asi left the artificial islands to settle in these new communities, a process that has continued ever since. Today, a large Lau community resides in the national capital, Honiara, and the provincial center, Auki. But the artificial islands remain important for people's identity and worldview, also for people born and raised in town. Several artificial islands in the lagoon, such as Abu, Kwaleunga, Longoaia, Kwaloai, Madanga, Kwailabesi, and Foufoiasi, have been abandoned. At the same time, new islands are constructed in the lagoon, mainly to develop tourism facilities. Nowadays, approximately 3600 people live in Lau Lagoon; much less than one hundred years ago [29].

Two Lau communities, Walande and Fanalei, are located on South Malaita, approximately 130 km south of Lau Lagoon. At least 12 generations ago, people settled here to hunt dolphins [19]. The porpoises are killed for their teeth, which are used for customary marriage and compensation payments, and for their meat, which is an important source of income and food for these communities. These two islands feature prominently in the climate change discourse in Solomon Islands as prime examples of sinking islands [30,31] (see Figure 4). Approximately 750 people now live in these two communities.

A closely affiliated ethnic group are the Kwai, who live on two densely populated islands on the East coast of Malaita: Kwai and Ngongosila. People here speak Guala'ala'a, which was used as a trading language along the coast [21]. Reliable census data is lacking but it's estimated that around 900 people live in these two communities. The saltwater people from Kwai and Ngongosila, and several other small artificial islands scattered around Uru Harbor, trade fish with the Kwaio people

from the uplands. Ngongosila was settled in 1955 when the South Sea Evangelical Mission built a church on the island [29].

Figure 4. The remains of the Anglican church of Fanalei (J. van der Ploeg, 2018).

2.2. The Langalanga

Langalanga is a 22 km long lagoon on the west coast of Malaita, and is one of the most densely populated regions of the country. Historically, the Langalanga people bartered fish for crops with the Kwara'ae, shifting cultivators who inhabited the forested hinterlands of the lagoon [32]. The saltwater people built artificial islands on the barrier reef of the lagoon and in the mangroves, and specialized in the production of tafuli'ae—strings of polished shells, which are traditional wealth items used throughout the Solomon archipelago for trade, feasts, and compensation and marriage payments [33,34]. There are around 59 artificial islands in Langalanga lagoon, most of them located in the mangroves and sago swamps. Approximately 6000 people live in the lagoon, including those in the settlements around Auki such as Aoke Island, Niu Kaloka, Ambu, and Lilisiana [29].

Historically, the livelihoods of the Langalanga people were characterized by much geographical mobility: Fishers moved along the west coast of Malaita to exploit a variety of marine resources, and they traded shell money with people from different islands [35]. European contact fundamentally altered livelihoods, trade networks, and social relations in the lagoon. The labor trade and evangelization efforts provided new goods such as steel axes, fishhooks, and guns, which enhanced agricultural productivity and led to widespread violence [21]. In 1909, the British colonial government established a station at the northern tip of the lagoon, present-day Auki town. In the 1930s, several shipyards were established in the lagoon. As a result, Langalanga people dominated inter-island trade in the British Solomon Islands Protectorate [36]. But in other ways the mobility of saltwater people, which was an important strategy to respond to environmental changes and shocks, became increasingly restricted. As more and more people settled along the coast, conflicts erupted over access to fishing grounds. Despite these developments, fishing remains the primary source of food and income for the saltwater people of Langalanga [37]. However, the widespread use of dynamite in the 1950s and overharvesting have led to a rapid decline in the productivity of the fisheries [38,39]. The limited prospects beyond the subsistence economy have stimulated urbanization: The saltwater communities around Auki town, such as Lilisiana, have grown rapidly over the past fifty years (see Figure 5), and many young and educated people migrate to Honiara in search of a better life.

Figure 5. Lilisiana in Langalanga Lagoon (J. van der Ploeg 2018).

3. Methodology

To illustrate the popular sinking islands narrative, a qualitative content analysis was conducted on articles published in the Solomon Star from January 2015 to March 2020 on the effects of climate change in Malaita Province [40,41]. Articles on climate change that did not specifically focus on Malaita were not included. Articles in the other daily newspaper in Solomon Islands, the Island Sun, were not included because this newspaper is often unavailable on Malaita. In total, 73 articles were compiled (in print and on-line) and encoded. Newspaper articles on climate change were published irregularly, with quite a few articles published in March 2015 in the aftermath of cyclone Pam, and in September 2017 in preparation for the United Nations climate change conference in Bonn, chaired by Fiji. A coding framework was developed by deriving categories directly from these newspaper articles. A potential problem of this inductive approach is the identification of all potentially relevant categories in the absence of a theoretical model. Yet, the categories of the coding framework overlapped to a large extent with key themes from the academic literature.

This paper tries to contextualize some of the claims made in these newspaper articles and reconstruct local socio-ecological events through an iterative process of inference and induction. Bradley Walters and Andrew Vayda [42] advocate such analysis to unravel the interacting causes of environmental change. Instead of relying on preconceived conceptual models and questionnaires, this flexible methodology enables the researcher to pursue lines of enquiry that emerge during fieldwork. An example from the field can illustrate this. Coastal erosion is threatening the small island of Ta'arutona in the West Are'are Lagoon, a process that is often attributed to climate change. Instead of asking if the recurrent floods were the effect of climate change, the authors walked around the island with key informants, asked people to describe the events, and discussed plausible explanations. The sinking of Ta'arutona Island seems to have started in the year 2000, after the mangroves on the island were cut for firewood to dry copra. Villagers say that the removal of the mangrove buffer has exposed the island more directly to waves. In December, king tides overflow the island, particularly when there is a strong northwestern wind. The floods, sometimes up to 30 cm above the ground level, destroy homegardens and coconut groves, and damage houses, despite the efforts of the villagers to build sea walls. People are concerned about an impending tsunami, and several households have re-settled on the mainland. Most young people from the village have moved to Honiara, which makes the maintenance of the sea walls problematic. Climate change induced sea level rise could play a role in the flooding of the island, but other neighboring villages in the lagoon, such as Pipisu and Rohinari, seem much less affected. As such, a more nuanced, complex, and uncertain explanation emerges for the environmental changes on Ta'arutona.

The analysis draws primarily on ethnographic fieldwork on Malaita in the period 2015–2018. In this period, the authors made several field trips in the context of the research and development program of WorldFish in the province [43]. The authors made repeated visits to villages in

Langalanga Lagoon, Lau Lagoon, West Are'are, East Malaita, and South Malaita to identify threats to coastal fisheries and rural livelihoods. Spontaneous interviews with community leaders, fishers, school teachers, church elders, customary chiefs, and members of women and youth groups were held on-site using Solomon Islands Pijin, the lingua franca of the country. In total, informal interviews were conducted with 171 people (61 women and 110 men) in 62 villages (see Figure 6 for the location of the villages mentioned in the text). In accordance with the WorldFish policy on ethics of research involving people, all respondents gave verbal prior and informed consent for an interview. No cash payments were made to the respondents. Community meeting were held in all villages before conducting the interviews to explain the aim and methods of the research. Information collected during the interviews was recorded in the author's notebooks, and triangulated when possible. These interviews were complemented with information from the community ward profiles compiled by the Provincial Government Strengthening Program (PGSP) and the community profiles of the Rural Development Program, Phase 2.

This research methodology clearly has limitations. First, by relying mainly on local ecological knowledge to describe and understand complex and long-term biophysical and ecological processes, this analytical framework is subject to criticism. But in the absence of quantitative, locality specific data, a situation that is unlikely to change in the near future, it is the only feasible way to generate empirical information in many remote rural areas in the tropics [44]. Second, this analytical framework might seem to have limited value for policy makers, donors, and development practitioners. This paper does not provide practical recommendations to improve CCDRM projects targeting the wane asi. Instead, the aim is to nuance a priori assumptions on the local impacts of climate change, and to better understand the links between climate change and other environment and development problems. It is hoped that this will lead to a better allocation of climate change funding.

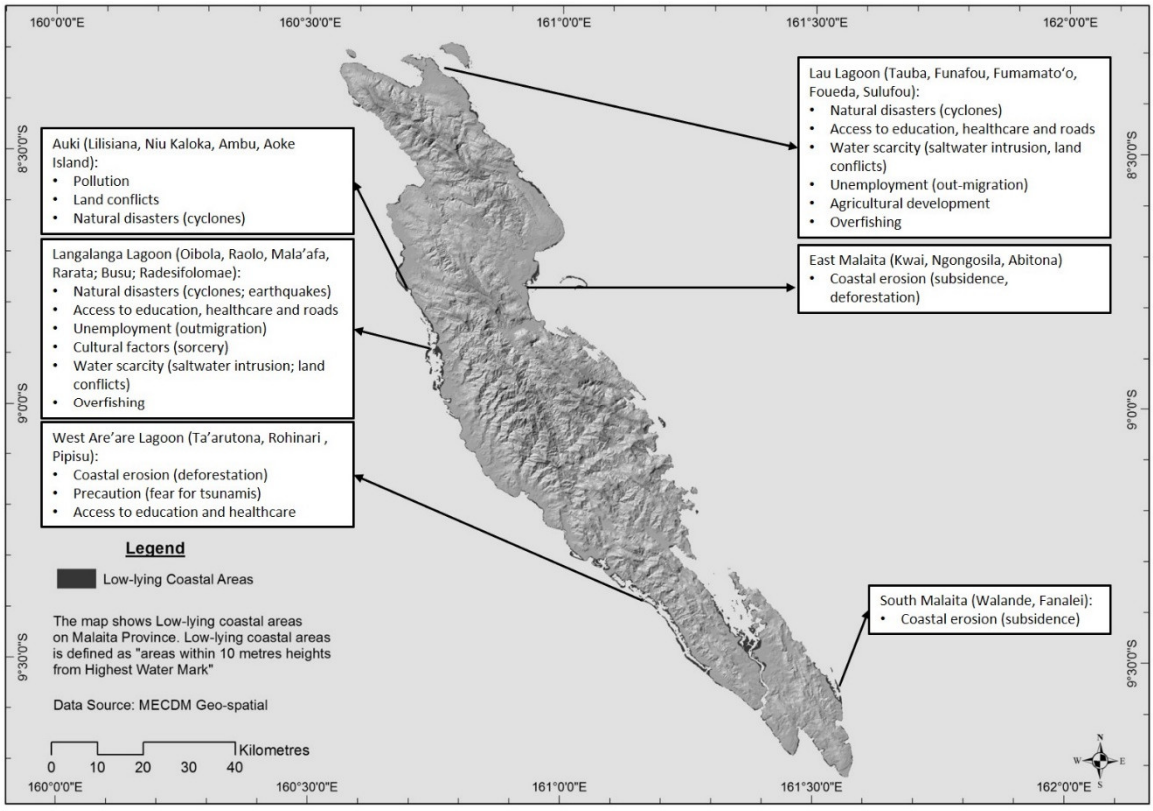

Figure 6. Artificial islands on Malaita mentioned in the text, highlighting the main reasons why people abandon these places.

4. Results: Content Analysis

A qualitative content analysis of newspaper articles documents how people in Solomon Islands perceive the threats posed by climate change (see Table 1). Of the 73 articles published in the Solomon Star on climate change on Malaita from 2015 to 2020, 34 (47%) identify sea-level rise as a critical and imminent threat for coastal communities. This recurrent theme is best expressed in a newspaper article from 2017:

> "*At the heart of the climate change concern is the looming disappearance of our tiny atolls in the region underwater. Communities living on these low-lying atolls have little hope because of the threat being posed by the rising tide (…) The last thing we want to see happen is our islands turning into a watery grave.*" [45]

Tropical cyclones are also often mentioned in newspaper articles on climate change on Malaita: Eighteen articles (24%) specifically mention the impact of extreme weather events on the livelihoods of saltwater people. One article prominently features a photograph of the abandoned houses on Walande Island:

> "*Every year there is some sort of an event whether it be prolonged dry season which throws all our crops of whack, a cyclone that we could only prepare for for 24 h, increased rainfall and flooding that surprised us in the night, killing our children and robbing us of our homes. This is our normal.*" [46]

Ten articles (14%) highlight the problems for agriculture and drinking water caused by saltwater intrusion.

> "*Seasonal crops that (the saltwater people) relied on for survival such as yam and pana are adversely affected. (…) Fruit trees are no longer bearing fruit and the coastal swamps that used to host their swamp taro patches are devastated by saltwater intrusion killing their crops in the process. Coastal wells and streams that the island residents depended on for survival are either dried up due to extreme temperatures or suffer as a result of saltwater intrusion.*" [47]

Other climate change threats highlighted in the Solomon Star are higher sea water temperatures (4%) and changing rainfall patterns (11%).

Forty-four articles bring up a potential climate change adaptation measure (60%). A major topic is the resettlement of island communities on the mainland (19 articles). Samson Sade, for example, writes that people on the man-made islands in Lau Lagoon in North Malaita are facing an "*existential threat*" and that resettlement in unavoidable:

> "*The rise in sea levels and erratic weather patterns make these islanders no longer safe in (their) homes so intimate with the sea. As a result, the residents have no choice but to flee the ever-deteriorating impacts that climate change has brought on their island environments.*" [47]

Other articles focus on introducing new drought- and salt-resistant crops (four articles), highlight the need to reduce CO_2 emissions (four articles), and call for resilient infrastructure (four articles). Three articles highlight the need to strengthen community-based resource management, for example, the protection of mangroves. Another three articles focus on enhancing the capacity of government agencies. The need to educate the public on the threats posed by climate change is mentioned in only two newspaper articles. Other articles propose climate change adaptation measures as diverse as setting up a carbon trading scheme, mainstreaming gender in decision making processes, strengthening community-based monitoring, praying, and playing soccer.

Table 1. Content analysis of articles published in the Solomon Star (2015–2020) on climate change in Malaita (n = 73).

Themes	Frequency	Percentage (%)
1. Sea-level rise	34	47
2. Extreme weather events (tropical cyclones)	18	24
3. Saltwater intrusion	10	14
4. Higher sea water temperatures	3	4
5. Changing rainfall patterns	8	11
6. Climate change adaptation measures	44	60

Note: there can be more than one theme per article.

Many articles in the Solomon Star describe a specific CCDRM project implemented by government agencies or development organizations such as WorldVision and Solomon Islands Red Cross. Projects issue a press release, conduct an activity, or invite journalists to join a field visit. As such, the articles on climate change reflect, to a large extent, the logic and priorities of these CCDRM projects. More problematic is that the budgets of these projects are also often mentioned in the newspaper, which can raise unrealistic expectations of people and lead to skepticism. Stephen Di'isango [48], for instance, records the frustrations of villagers in the province:

> "*There are huge sums of money injected into programs supporting implementation of the national climate change strategies by Solomon Islands Climate Change program (at least 10 million Solomon dollar) but no one knows or sees the effect of it…*"

Particularly, the plans of MECDM and the provincial government to facilitate the resettlement of people from the artificial islands have generated much friction:

> "*In 2011, then Minister for Environment John Moffat Fugui announced Fanalei and its nearby sister island of Walande would be amongst the first atolls and islands the government was looking at implementing relocation programs over the next two years. The relocation, he said, will be funded under a 30 million dollar European grant. Six years on, the residents of Fanalei said they are yet to see or receive any funding assistance from the national government.*" [49]

False expectations of financial assistance risk undermining the adaptive capacity of coastal communities. Historically, the wane asi were highly autonomous communities with no central authority, who could respond to changing environmental conditions, for example, by building higher sea walls or settling in better locations (see Asugeni et al. [50] for a recent example of community-based adaptation to climate change). However, nowadays many communities seem to be waiting for the government to take action. Leslie Sanga [51], for example, quotes a villager from East Malaita who says:

> "*The rising sea is now under some of our houses, it's only a matter of time before these houses collapse. Soon, we will have to relocate. There's no question about that. But who will fund our relocation? That's the question we've kept asking. Relocation is not cheap, it's like starting life all over again. So we need the government to assist us build new homes.*"

In fact, many people do not want to resettle. Ronald Toito'ona [52] highlights the experiences of the wane asi on Kwai Island on East Malaita:

> *"For years they have built seawalls around the island, with no direct support from the government. Most have also refused to relocate to the mainland, not wanting to leave their ocean life behind. 'We are the salt-water people and we have a very close bond to the beach and island environment,' said Erastus David Mafane, an elder living in the island of Kwai. 'Relocating to the mainland might be a better idea for others, but not us.'"*

5. Discussion

The sinking islands narrative has become deeply embedded in public perception and policy discourses in Solomon Islands, and forms the foundation of climate change policies and CCDRM projects. It is, however, based on several assumptions, simplifications, and inconsistencies.

5.1. Sea-Level Rise

In the climate change discourse, sea level rise is presented as a critical and imminent danger for Pacific Islanders. For instance, an article in the Island Sun read: "sea level rise is the biggest threat for the artificial islands now, as most of the man-made islands are now partially under-water even from normal high tides" [53]. However, the common assertion that climate change induced accelerated sea-level rise erodes the artificial islands and thereby forces people to relocate to the mainland confounds causes and effects. Over the past years, some artificial islands have indeed been abandoned, but this usually happened after its inhabitants relocated to the mainland. Thus, the abandonment of the islands leads to erosion; not the other way around. The islands require constant maintenance to avoid the collapse of the sea walls; when people no longer live on the islands, they slowly fall apart.

There is no doubt that the saltwater people are leaving the artificial islands. For example, in the 1970s, approximately 5500 people lived on the islands in Lau Lagoon [25,54]. The 2009 census recorded 3616 people in the lagoon [55]. It would, however, be erroneous to attribute this decline to sea-level rise. Malaria and tribal warfare, the main reasons to live on the artificial islands, are no longer acute and menacing threats. People have settled around the missions, schools, hospitals, and roads on the mainland, a process that started in the 1920s and has continued ever since. The saltwater people have also diversified their livelihoods: Many people have expanded their gardens and created cash crop plantations on the mainland. More recently, there has been an exodus of people to Honiara. Ben Buga and Veikila Vuki [56], for instance, estimate that 70% of the young people of Foueda, an artificial island in Lau Lagoon, have moved to the capital in search of jobs or to attend school.

Sea-level rise manifests itself primarily during king tides. Catherine Wilson [57], for example, writes that, on Raolo Island in Langalanga Lagoon: "the tides are getting higher, the waves come right across the island during the wet season." To some extent, this has always been the case. The Anglican missionary Walter Ivens [20], who travelled around Malaita between 1895 and 1909, for example, writes:

> "*The islands are all built up to a height sufficient to keep out high spring-tides, and the only danger of flooding is in December and January, when the very high tides which then occur may be banked up in the lagoons by a strong north-east wind. At such times it is* not uncommon for the water to come into the houses*, but this is part of the life and nobody minds*." (emphasis added)

One problem with the sinking islands narrative is that it neglects such historical records. What seems to have changed over the past century is not so much the occurrence of flooding, but rather people's vulnerability to flooding: People have more goods, such as papers and electronics, that cannot become wet, and new buildings are often constructed with concrete and timber instead of sago stalks. Raolo Island is, in fact, an interesting case. Most households abandoned the artificial islet after cyclone Namu in 1986 and built a new settlement on the mainland. But during the ethnic conflict in the early 2000s, these people were forced to abandon their new village by Kwara'ae land owning clans. It illustrates the complex dynamics of settlement patterns on Malaita.

5.2. Extreme Weather Events

Few climate change effects capture the public imagination so much as extreme weather events. Climate change models in fact predict a substantial decrease in the total number of tropical cyclones in the Southwest Pacific, although the intensity of the remaining storms might increase [58]. Along the coast of Malaita, severe storms have destroyed entire islands. Tropical cyclone Angela, for example, caused a 9 m (!) storm surge that flooded the artificial islands in Langalanga in 1966 [59]. A

year later, in 1967, cyclone Annie destroyed houses and coconut plantations in North Malaita, and in 1972, tropical cyclone Ida caused massive devastation in the province and encouraged landward migration [35]. Several artificial islands in Langalanga Lagoon, such as Rarata Island, were permanently abandoned after cyclone Namu in 1986, the worst tropical cyclone to have affected Solomon Islands on record (see Figure 7). It illustrates that tropical storms have always been an integral part of life for coastal communities in the archipelago [60]. In fact, cyclones also create opportunities: The village of Abitona in East Malaita was built on a sandbank created by a severe cyclone in the 1920s. The new land proved attractive to settle on, particularly as there were no existing land claims. Nowadays, the village is flooded by king tides in December and January, but whether this is a new phenomenon or caused by climate change, soil compaction, the cutting of mangroves, or a combination of these factors, remains unclear.

Albert et al. [61] conclude that the erosion of reef islands in Solomon Islands results from a dynamic interplay of extreme weather events, plate tectonics, ocean currents, and anthropogenic factors, such as inappropriate infrastructural development, rather than climate change alone. Kwai Island on East Malaita provides a clear example of the convergence of multiple stressors:

> "*The islands of Kwai and Ngongosila are feeling the effects of increasingly severe weather and rising tides. (…) Elders say they were once triple their current size. (…) 'Kwai Island during our childhood days is a very beautiful place. There are huge trees in the island, where we also did gardening,' said Janet Logafe Billy, 70, who was born on Kwai and left for the mainland after getting married. Today, the island is transformed, (she) says. The big banyan trees by the shores are gone, which has resulted in soil erosion.*" [62]

A geological survey in 1990 concluded that, during the northwestern monsoon winds from September to March, the so-called koburu, currents are eating away the eastern side of Kwai Island [63]. Most of the sand is trapped at the southern part of the island, a process that is reversed during the ara season when the wind blows from the southeast. Overall, the island has not changed significantly in size since the 1960s. But nowadays there are more permanent houses on the island, which has led to deforestation. Whereas the island was covered with forest in the 1960s, there are now virtually no more trees on the island. Particularly, the cutting of large dalo trees (*Calophyllum inophyllum*) along the shoreline for firewood and to make space for houses seems to have worsened the coastal erosion problem.

Figure 7. Rarata Island in Langalanga Lagoon (J. van der Ploeg, 2017).

5.3. Saltwater Intrusion

Climate change will have substantial impacts on freshwater aquifers, particularly on low-lying islands in the Pacific [64]. John Walenenea [8], for instance, documents saltwater intrusion in two saltwater communities in Langalanga Lagoon: Busu Island and Radesifolomae. Wells have become

unsuitable for drinking as a result of saltwater intrusion, and women now have to paddle considerable distances to collect water during dry periods. But that is only one part of the story: The villages used to have a functional water system, but the dam and the water pipes were vandalized during a land dispute. Similar issues occur in Lau Lagoon, where water pipes that provide water to the artificial islands are occasionally blocked or damaged during land conflicts. Climate change will likely sharpen these social issues [65], but attributing freshwater scarcity on the artificial islands solely to global warming is flawed.

Lilisiana is another interesting case in this respect. This village features prominently in the climate change discourse, and is targeted by a number of CCDRM projects [30]. Lilisiana was built in the 1920s on the outskirts of the newly established government station in Kwaibala, present day Auki town. More saltwater people settled in the village in the aftermath of cyclones in 1952, 1972, and 1986 [29]. At present, Lilisiana is the largest neighborhood of Auki, with approximately 500 inhabitants. Houses are built on the narrow beach and in the mangroves between Osi Lake and Auki Harbour. During cyclones, king tides, and heavy rainfall the village is inundated. Climate change will exacerbate these drainage problems, but is not causing the flooding. The lack of solid waste management facilities and poor urban planning are arguably more proximate causes for the recurrent floods.

In some other cases, the desertion of an artificial island has categorically nothing to do with climate change. Mala'afa Island in Langalanga Lagoon, for example, was abandoned after all members of the land-owning clan died of sickness or committed suicide. People attribute this to sorcery, and think the island is cursed.

5.4. Higher Seawater Temperatures

To illustrate the climate change impacts on coastal fisheries, the State of the Environment in Oceania report [66] quotes George Alabeni from the Airahu Rural Training Centre in the Solomon Islands:

> *"The sea is very hot sometimes and it is not pleasant. Older people have not seen it like this before. The world is changing, everything is changing. Before you just go down to the shore and might take fish and see a lot of seashells, crabs and the beauty of the sea; everything. Good temperature. There are birds all around the beach, very white beach. Now seabirds' coastal homes are being destroyed, and dead fish are washing up on shore. We don't expect it, and it's new to us. We have never seen those things happening."*

Indeed, higher seawater temperatures will negatively impact coastal fisheries through coral bleaching and ocean acidification [67,68]. Compared to other countries in the region, coral bleaching has so far caused limited damage to coral reefs in Solomon Islands [28]. In practice, it is difficult to untangle the multiple stressors of coral reefs and their ability to produce fish. Albert et al. [69], for example, document a large algal bloom in 2011 in Marovo Lagoon in Western Province, which had detrimental impacts on live coral cover and shellfish. But whether this dead zone was caused by increased seawater temperatures, eutrophication due to logging-induced sedimentation, the overharvesting of detrivorous sea cucumbers, or a combination of these factors remains unclear.

The sinking islands of Fanalei and Walande on South Malaita provide another example of the difficulties of disaggregating the multiple stressors of tropical coastal ecosystems in remote, data-scarce areas in the developing world. Geologically, the southeast coast of Malaita is affected by rapid subsidence and earthquakes [70] (see Figure 8). Fanalei Island was heavily impacted by a 7.8 magnitude earthquake in December 2016: A large crack formed and a part of the low-lying island subsided. After this event, tides started to flood the village, and many people relocated to the mainland. Walande Island was largely abandoned in 2017, a process that commenced in 1987 when the Anglican Church of Melanesia fostered an agreement with wane tolo land owners, built a church, and encouraged the wane asi to settle in the new village [30]. Interestingly, before settling on Walande Island, people lived on Namo Island, which was abandoned in the 1930s after a tsunami (see Figure 9). And in the mythical past, the ancestors of the people of Walande lived on a small off-shore island called Hile, which was, according to oral history, also destroyed by a tsunami (also see Nunn et al.

on the disappeared Pororourouhu Islands off the coast of South Malaita [71]). Other coastal areas on Malaita are also subject to geological upheaval: Gold [72], for example, reports that two severe earthquakes in October 1931 destroyed several artificial islands in Bina Harbor in Langalanga Lagoon. In fact, fear for an impending tsunami or cyclone is an important motivation for many wane asi to move from the artificial islands to the mainland.

Figure 8. Rapid subsidence on the southeast coast of Malaita (J. van der Ploeg, 2017).

Figure 9. Walande Island on South Malaita (J. van der Ploeg, 2018).

5.5. Changing Rainfall Patterns

Most people on Malaita equate climate change with changing weather patterns. The PGSP ward profiles illustrate this clearly: People on the artificial islands identify erratic rainfall as the main climate change threat [29]. For instance, William Pwaisiho [73] quotes a man from Walande on how he feels about climate change:

> "*The weather is abnormal, it's not really following the pattern as we have seen before. (…) I feel scared about it. And even our children too are often scared. Because it's beyond our reach, what we are going to do about it. It's out of the way we can control it.*"

Heavy rains can make the daily canoe trip to school hazardous for children (see Figure 10). During the koburu season, women have difficulties travelling to the market. Many wane asi have therefore opted to relocate to the mainland.

It is predicted that changing rainfall patterns will constrain subsistence agriculture in the Pacific [74]. In Solomon Islands, rainfall patterns have shown little change since the 1960s [75], and there is no

indication that extreme rainfall or drought is currently threatening food security on Malaita. The notorious 1997/1998 El Niño drought affected gardens in North Malaita, but the most serious problems were felt in the urban centers and on remote coral atolls [76]. Historically, the wane asi cultivated swamp taro, yams, and sweet potatoes on the mainland. Traditional crop rotation schemes and fallows have been shortened as farming systems have intensified over the past fifty years [77]. Consequently, soil degradation, erosion, and pests have become serious problems. Agricultural development is further hampered by a structural lack of technology, skills, credit facilities, farm-to-market roads, reliable energy supplies, and agricultural extension services [78]. There are a number of concerns about food security and nutrition on Malaita, particularly related to the replacement of traditional diets by cheap, nutritionally-poor imports, such as noodles, and its long-term impacts on health [79]. A number of other interconnected social and political problems, such as youth unemployment, poor healthcare and education, gender-based violence, land tenure disputes, corruption, alcoholism, urbanization, and expectations of modernity further contribute to food insecurity and health problems. These multiple stressors highlight the complexity of contemporary food systems [80] and the limits of focusing on a single explanatory factor when trying to solve these problems.

Figure 10. Children on their way to school (J. van der Ploeg, 2016).

5.6. Climate Change Adaptation Projects

The sinking islands have become a dominant theme in global and local climate change discourses, and have become some sort of litmus test for international donors, government agencies, and development organizations [12]. Over the past ten years, a variety of CCDRM projects have been implemented on the artificial islands of Malaita (see Table 2). It is estimated that, in the period 2010 to 2016, at least USD 112 million has been allocated for CCDRM projects in Solomon Islands [81].

Many of these projects aim to build on the indigenous knowledge of the wane asi in order to identify and strengthen "participatory community-based climate change adaptation planning processes" [82]. The Solomon Islands Red Cross, for example, facilitated vulnerability and capacity assessments on several artificial islands in Lau and Langalanga. It found that "access to usable water is a major problem due to increasing salinization of local water tables caused by rising sea levels" [83], and subsequently donated rainwater storage tanks to several communities. The United Nations Development Program implemented the Strongem Waka lo Community fo Kaikai (Strengthening Communities for Food Security) project, which organized community meetings to assess the impacts of climate change, physically mapped projected sea-level rise by placing red pegs 1 m above the high-water watermark to raise people's awareness of climate change, and distributed vegetable seeds [84]. And the Community Resilience to Climate and Disaster Risk Project of MECDM conducted scoping

visits in twenty communities in Langalanga Lagoon and on Small Malaita to develop community-based disaster risk management plans.

But, despite this grassroots rhetoric, most CCDRM projects remain strongly donor-driven and technocratic, and participatory processes are highly manipulative [85,86]. It is perhaps not surprising that when consultants for the Coping with Climate Change in the Pacific Island Region project visit a village, people will identify climate change as a problem in order to secure rainwater storage tanks, seeds, building materials, training opportunities, and other forms of support. People's experiences with the Coastal Community Adaptation Project (C-CAP) project on Malaita illustrate the problems of many CCDRM projects. At the start of the project, the national media reported extensively on the USD 17.9 million grant to support local-level climate change interventions in 77 villages in nine Pacific Island countries. On its website, MECDM reported that USD 65,000 would be available for each of the ten villages selected on Malaita, including five saltwater communities in Langalanga Lagoon and two artificial islands in East Malaita. In all these communities, C-CAP facilitated a participatory process to "identify current and projected climate change impacts, map existing community infrastructure assets, and prioritize infrastructure-related adaptation needs" [87]. The project then contracted a construction company to place four 50,000 L polyethylene water storage tanks in all these villages (see Figure 11). In Oibola, for example, C-CAP placed four tanks. Here, people appreciate the new drinking water system and make intensive use of it, but people also know that a rainwater storage tank costs around USD 1700 and question what happened with the budget of the ministry. Clearly, people understand that the construction, transport, labor, and administration costs need to be included, and that these costs are relatively high in Solomon Islands. They have much less sympathy for the costs of the scoping visits, consultants, participatory maps, community workshops, and climate change adaptation plans. After all, people already know what the problems are in their village, and that the project would eventually provide a rainwater storage tank.

People on the artificial islands strategically link their needs and priorities to climate change issues to gain access to development aid. In the words of Simon Foale [88], people simply "play along" to obtain hand-outs and cargo. As a result, climate change is directly linked in the public perception to development aid. In many villages, this has fostered aid dependency and clientelism, or what is locally sometimes labelled as a "hand-out mentality" [89]. This opportunistic rent-seeking behavior explains, to a large extent, why villagers consistently report that climate change is threatening their livelihoods. Another reason is that local perceptions and worldviews are increasingly influenced by global discourses [90]. The wane asi read newspapers articles, watch movies, browse the web, and check Facebook, and they use this information to contextualize and give meaning to their daily experiences. Modern education, urbanization, information technology, and mass media often depreciate ecological knowledge and traditional coping strategies, and promote modern solutions for environmental problems, a process that CCDRM projects, often unintentionally, reinforce [91,92].

By focusing on anticipated climate change impacts, such as sea level rise, most CCDRM projects divert scarce government resources and capacity from more urgent environment and development problems, and risk undermining the efforts of coastal communities to address these problems [92,93]. CCDRM projects typically target only a few opportunistically selected communities, thereby fostering political clientelism and opportunistic rent seeking. Externally-funded projects typically neglect the limited capacity of the national government, by-pass provincial and customary governance structures, and promote capital intensive interventions, which makes it impossible to sustain or scale-out these interventions. Much funding is siphoned off through institutional overheads, consultants, inception meetings, and training workshops. In the end, very little reaches vulnerable communities [81]. The mismatch between publicly announced climate funds and the actual activities on the ground fuels suspicion of malversation and corruption, and often causes friction between villagers, project staff, and government officials. This is particularly problematic because international climate funding often takes place at the expense of existing development aid and in a context of deteriorating public services, state-sponsored resource extraction, political patronage systems, and a history of failed development projects [94]. Health care, education,

infrastructure, and other basic government services in the rural areas remain very poor, despite ambitious government plans and substantial international development aid after the civil unrest in 1999–2003 [95]. As a result, people have become deeply cynical of the ability of the government and development organizations to improve conditions [96,97].

Moreover, many proposed community-based adaptation measures, such as building rainwater storage tanks, farming corals, raising awareness, and establishing homegardens seem woefully inadequate for the projected impacts of climate change [98,99]. In a certain way, many investments of CCDRM projects in water systems, relocation, or agriculture weaken traditional coping mechanisms such as mobility, autonomy, communal labor, and livelihood diversity that have enabled saltwater people to adapt to environmental change.

Figure 11. Rainwater storage tank on Kwai Island (J. van der Ploeg, 2017).

Table 2. Examples of Climate Change and Disaster Risk Management projects in Malaita Province.

Project Title	Implementing Agency	Donor	Timeframe	Aim	Budget (USD)	Source
Coping with Climate Change in the Pacific Island Region (CCCPIR)	SPC, GIZ, SPREP and USP	BMZ	2009–2015	Strengthen the capacities of Pacific Island Countries and regional organizations to cope with the anticipated effects of climate change affecting communities across the region.	20,000,000	https://www.spc.int/cccpir
Pacific Adaptation to Climate Change (PACC)	MAL and SPREP	UNDP, AUSAID, GEF	2009–2014	Reduce climate vulnerability by demonstrating best-practice adaptation in three key climate-sensitive areas: coastal zone management, food security and food production, and water resources management	5555,000 (national allocation)	https://www.adaptation-undp.org/sites/default/files/downloads/pacc_cb_sol.pdf
Mangrove Ecosystems for Climate Change Adaptation and Livelihoods (MESCAL)	IUCN	BMU	2010–2013	Address the key challenges of mangrove management to increase the resilience of the people to climate change and improve livelihoods in five Pacific Island Countries	3100,000	https://www.iucn.org/downloads/mescal_midterm.pdf
Malaita Community Resilience and Livelihoods Project	World Vision	ANCP	2010–2014	Enhance community resilience to mitigate the effects of natural disasters on food and livelihood security in 15 communities in Malaita Province		https://www.wvi.org/sites/default/files/HEA%20Fact%20Sheet%20Solomon%20Islands%20-%20Final%20-%20updated%20April%202013.pdf
Strongem Waka lo Community fo Kaikai (SWOCK)	MAL and MECDM	UNDP	2011–2015	Promote community-based climate change adaptation activities that enhance food security and livelihood resilience in pilot communities on the artificial islands of Malaita	5533,500	https://www.adaptation-undp.org/projects/af-solomon-islands
Solomon Islands Climate Assistance Program (SICAP)	MECDM	EU	2011–2014	Reduce vulnerability of communities living on low-lying atolls, artificially built islands, and other low-lying coastal areas in Solomon Islands	3170,000	https://www.gcca.eu/programmes/solomon-islands-climate-assistance-programme
Climate Change and Food Security	SPC	USAID	2012–2014	Evaluate and implement innovative techniques and management approaches to increasing the climate change resilience of terrestrial food production systems for communities in Fiji, Kiribati, Samoa, Solomon Islands, Tonga, and Vanuatu	4000,000	http://ccprojects.gsd.spc.int/documents/root_docs/SPC%20USAID%20Project%20Overview.pdf
Coastal Community Adaptation Project (C-CAP)	DAI	USAID	2012–2017	Improve small-scale community infrastructure and building local capacity for disaster prevention and preparedness in the Pacific	18,370,000	https://pdf.usaid.gov/pdf_docs/PA00MSXM.pdf
Community Resilience to Climate and Disaster Risk Project (CRISP)	MECDM	World Bank/GEF	2014–2020	Increase the capacity of selected rural communities to manage natural hazards and climate change risks	9130,000	https://projects.worldbank.org/en/projects-operations/project-detail/P112613

Solomon Islands Water Sector Adaptation Project (SIWSAP)	MECDM and MMERE	UNDP	2014–2019	Improving the resilience of water resources to the impacts of climate change in order to improve health, sanitation, and quality of life, and sustain livelihoods in target vulnerable areas	6850,000	https://www.adaptation-undp.org/projects/ldcf-solomon-islands-water-sector-adaptation-siwsap
Pacific Ecosystems-based Adaptation to Climate Change (PEBACC)	SPREP	BMU	2014–2019	Explore and promote ecosystem-based adaptation options for adapting to climate change	5575,000	https://www.international-climate-initiative.com/fileadmin/Dokumente/2015/PEBACC_Factsheet.pdf

Notes: ANCP: Australian NGO Cooperation Program. AUSAID: Australian Aid. BMU: German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. BMZ: German Federal Ministry for Economic Cooperation and Development. DAI: Development Alternatives Inc. EU: European Union. GEF: Global Environment Facility. GIZ: German Corporation for International Cooperation. IUCN: World Conservation Union. MAL: Ministry of Agriculture and Livestock. MMERE: Ministry of Mines, Energy and Rural Electrification. SPC: Pacific Community, SPREP: Secretariat of the Pacific Regional Environmental Programme. UNDP: United Nations Development Programme. USAID: United States Agency for International Development. USP: University of the Southern Pacific.

6. Conclusions

In sum, little reliable scientific information is available on how climate change impacts on the dynamics, vulnerability, and resilience of coastal lagoon systems in the Pacific [100]. There is, however, strong evidence that unsustainable fishing methods, such as small mesh gillnets and spearfishing at night, are impacting on coastal fisheries on Malaita [101]; that corporate logging causes erosion and siltation of coastal ecosystems in the province [102]; and that the clearing of mangroves threatens the food security and livelihoods of the wane asi [103]. It is well-known that communities in the province are coping with a range of social issues such as alcoholism, crime, and domestic violence [104]. It is documented that 52% of households on Malaita lack access to an improved source of drinking water, that 85% do not have basic sanitation facilities [105], and that 40% of two to five-year-old children in wane asi communities are malnourished [79]. It is also widely acknowledged that public infrastructure in Solomon Islands, such as rural health clinics, schools, roads, bridges, and wharfs, have deteriorated over the past twenty years [106]. Addressing these problems will reduce the vulnerability of coastal communities to long-term impacts of climate change. The reverse is unfortunately not the case. In fact, a narrow focus on climate change adaptation tends to distract from other, more pressing environment and development problems [107].

So why does the sinking islands narrative remain so persistent, despite the uncertainty, complexity, and contradicting empirical evidence? Partly, it can be attributed to opportunism from government agencies, donors, civil society organizations, and rural communities [108]. Partly, it offers a simple solution for a range of wicked problems: Reductionism is useful, and perhaps even necessary, to mobilize financial resources in the international political arena [109]. And, partly, the sinking islands discourse is what Ilan Kelman has called a 'convenient distraction' [107]. A focus on climate change de-politicizes environmental and development problems: By emphasizing a new, external, and all-surpassing natural hazard, decision-makers mask their failure to address the root causes of people's vulnerability, such as poverty, weak governance, corruption, and inequality [110]. After all, it is much easier to draft a community-based disaster risk management plan than to hold logging companies accountable, enforce fishing gear restrictions in remote areas, operate rural health clinics, or organize community committees to maintain water supplies.

This paper is not belittling the long-term impacts of climate change on coastal communities in the Pacific. The point is that the climate change threats projected by journalists, policy-makers, and development experts are often highly uncertain and distant, and that the wane asi have to cope with a range of more severe and urgent problems right now. The saltwater people should not be portrayed as helpless victims of climate change. Instead the focus should be on finding practical ways to enable these people to cope with rapid social and environmental changes.

Author Contributions: Conceptualization, J.v.d.P., H.E., T.M. and H.G.; methodology, J.v.d.P. and H.G.; fieldwork, J.v.d.P., M.S., T.M., H.E. and H.G.; literature review, J.v.d.P. and H.G.; data analysis, J.v.d.P.; original draft preparation, J.v.d.P.; review and editing, H.E., H.G., T.M. and M.S.; project administration, M.S. All authors have read and agreed to the published version of the manuscript.

Funding: This work was undertaken as part of the CGIAR Research Program on Fish Agri-Food Systems (FISH) led by WorldFish. Field work activities were carried out in the framework of the Strengthening coastal and marine resources management in the Coral Triangle of the Pacific project funded by Asian Development Bank (TA-7753). Additional financial support was provided by the Australian Government through the Australian Centre for International Agricultural Research (ACIAR) project FIS/2016/300.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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