1. Ecological communication in Asia-Pacific

A comparative analysis of social adaptation to maritime disaster in Indonesia and Fiji

Abstract: This article is of a comparative study of social adaptation in the Cyclone Winston disaster case in Fiji and rob flooding in Semarang, Indonesia. In February 2016, the largest tropical storm in the Southern Hemisphere, Cyclone Winston, struck Fiji and caused severe damage and loss of life. Meanwhile, in the last two decades flooding has become an increasingly acute disaster situation in Semarang and the northern coastal region of Java, Indonesia. Communities in the path of both these disasters are the ones who suffer most. Social adaptation is important to consider in these two cases to encourage improved future mitigation and adaptation efforts. Data was collected from interviews and documents in the form of news media articles and previous research reports relevant to tropical disasters and the impact of climate change. The results show that social adaptation to both types of disasters is not identical due to the characteristics of the two different disasters and the different social, economic, political and cultural contexts in Fiji and Indonesia.

Keywords: cyclones, Cyclone Winston, ecological communication, Indonesia, Fiji, maritime disasters, Oceania, participatory action research, *rob* flooding, social adaptation, tropical storms

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Introduction

MARITIME disasters are a major problem in Southeast Asia and Oceania, where most of the area is the ocean; this includes the vast Pacific Ocean, which covers one-third of the Earth's total surface. Both regions are highly vulnerable to maritime disasters, hurricanes, cyclones, and their effects. In Indonesia, especially along the north coast of Java, the most catastrophic disasters are floods that have destroyed areas from North Jakarta

to Semarang and Demak. In Oceania, several cyclones have devastated Pacific micro-states, particularly the largest tropical storm in the Southern Hemisphere, Cyclone Winston, which struck Fiji in February 2016. The communities in the path of these disasters are those that suffer most. Tidal flooding and cyclones have caused massive social and economic losses in communities in these two regions (McLean et al, 2001; Wuryanti, 2001; Marfai, 2008). The communities in Indonesia and Fiji have responded to disasters in various ways in order to reduce the impact of disasters and the risk of future ones. This article aims to analyse the social adaptation made by the communities on the north coast of Java, Indonesia, and in Fiji in their efforts to cope with disasters.

Southeast Asia is a region with a special geographical situation, encompassing the so-called 'ring of fire'[1] It stretches some 6,400 kilometres at its greatest extent (roughly from northwest to southeast) and encompasses some 13 million square kilometres (Figure 1). Of this, about 4.5 million square kilometres is land and 8.5 million square kilometres is sea (Leinbach & Frederick, n.d.). This vast water territory is subject to disasters, be they natural or human-made, geomorphological or maritime. Maritime disasters such as tidal flooding, storm surges accompanied by wind and rain, tsunamis, abrasion, floods, and rising sea levels threaten coastal communities, their health, and their livelihoods.

Indonesia, with more than 13,000 islands, is the world's largest archipelagic country, as well as having the second longest coastline (57,716 kilometres) after

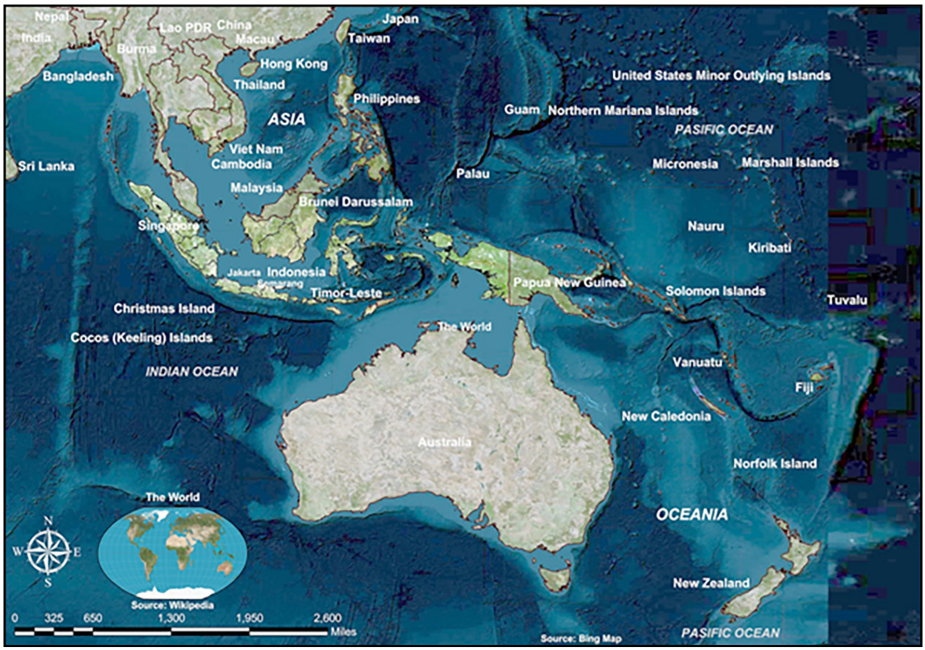

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Figure 1 : Southeast Asia and Oceania map.

Canada (Countries with the longest coastline, 2013; Indonesia, 2018). It has faced various types of maritime disasters, including tsunamis (in Aceh in 2004 and in Pangdaran in 2006), high waves, tropical cyclones (Dahlia and Cempaka in 2017). Among the most serious has been the coastal flooding along the north coast of Java, particularly in the Semarang area, where 21 rivers reach the sea (Nashrrullah et al, 2013). This *rob* flooding, as it is known locally, has been problematic for a long time (Marfai & King, 2008; Harwitasari & Ast, 2011). Without an adaptation strategy, the *rob* flooding has become complex, protracted, unresolved, and caused greater and greater losses, especially for people living in the affected areas. Despite being a slow-onset disaster, this flooding has caused enormous socioeconomic losses in affected areas as well as considerable environmental harm (Figures 2 and 3). In Semarang, the *rob* flooding has caused factories to close; roads and buildings to be elevated; and heavy traffic (Abidin et al., 2013; Hadi, 2017; Robie, 2017c). *Rob* flooding has also been a serious health hazard by creating an unhygienic environment, undermining community livelihoods, disrupting educational activities, changing the way people socialise, and forcing people to migrate.

Oceania is represented by 16 micro-nations and territories, which belong with Australia and New Zealand to the 18-member Pacific Islands Forum (PIF). It covers 8.5 million square kilometres and comprises 40 million people (including Australia and New Zealand, which contribute 26.9 million people, leaving a

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Figure 2: *Rob* floods inundated this main road and caused long traffic jams in the Pantura area which has become the main economic route of Java Island.

Figure 3: Houses damaged and abandoned due to rob floods and land subsidence in Tambak Lorok fishing village, Semarang.

balance of 13.1 million in Pacific states and territories).[2] Many scientists argue that few areas in the world are as vulnerable to the effects of maritime disasters and climate change as the 'low-lying atoll island nations' of the Pacific (Campbell & Barnett, 2010; Morgan, 2017; Terry, 2007; Walsh, McInnes & McBride, 2011). 'Even at current mean sea levels, vulnerability to extreme sea levels is large,' according to Walsh and colleagues.

Forty-six years ago, in 1972, Cyclone Bebe left a trail of havoc in Tuvalu (population 11,097), including mounds of coral debris. Eighteen years later, in 1990, in Samoa, Cyclone Ofa flooded many low-lying coastal regions (Walsh, Innes & McBride, 2011, p. 150). In 1997 in Fiji, Cyclone Gavin breached sea walls with a storm surge on the north coast of Vanua Levu, flooding the provincial capital of Labasa. In 2004, Cyclone Heta devastated most of the infrastructure in the tiny island nation of Niue (pop. 1,611) (Terry, 2007). In 2009, an earthquake and tsunami with magnitude 8.1 struck Samoa, including American Samoa and Tonga, killing 189 people and injuring hundreds, Meanwhile, in 2015, Severe Tropical Cyclone Pam, considered the second most intense tropical storm to strike the South Pacific, with winds reaching up to 280 kilometres an hour, devastated Vanuatu. The worst maritime disaster ever to hit the country, this Category 5 storm caused the deaths of 16 people and an estimated US$360.4 million in damage, crippling the nation's infrastructure and leaving 3,300 people homeless (UNESCO Supports Recovery, 2015).

In February 2016, Fiji suffered the most intense and costliest tropical cyclone on record in the Southern Hemisphere (After Tropical Cyclone Winston, 2016; Tabureguci, 2016). With winds reaching up to 285 kilometres an hour, Severe Tropical Cyclone Winston killed 44 people and wreaked an estimated US$1.4 billion in damage. Some 40,000 homes were destroyed, and an estimated 350,000 people—about 40 percent of Fiji's population—had their lives severely affected. Writing for *Business Melanesia* in an assessment of the disaster, journalist Dionisia Tabureguci noted that tourism and remittances were 'standing by as the white knights' as Fiji sought to 'pick up the pieces' economically (Tabureguci, 2016).

This article seeks to compare and analyse the social adaptations made by communities in Semarang, on the north coast of Central Java, in Indonesia, in the face of tidal flooding, and in Fiji in the wake of Severe Tropical Cyclone Winston. Social adaptation is important to understand in these two disasters to encourage better disaster mitigation, adaptation, and risk management efforts in the future.

Literature review

Ecological communication is one possible means of adapting to the risks of maritime disaster. This concept was developed by Niklas Luhmann in the 1980s, and since then it has sparked debate among scholars. This concept explains how social systems in modern communities respond to external threats such as disasters. Luhmann believes that societal communication affects the very way the possibilities of environmental dangers arise (Luhmann, 1989, p. xv). Ecological communication explains not how society manages existing environmental problems, but how it becomes aware of environmental dangers (Cuginotti, 2014). The risk of environmental danger is recognised when people communicate about unsustainable ways of living, such as the use of plastic bags and excessive pollution from factories. According to Luhmann (1989), human response to communication is called resonance. This means human consciousness does not depend on human agency, but rather a response (*resonance*) to events in the environment (Cuginotti, 2014). This response later shapes the way a community adapts to environmental dangers. Luhmann warns that there is a high chance modern societies will collapse due to their inability to respond constructively to environmental threats. In this perspective, modern society can be analysed through the three dimensions of communication, evolution, and differentiation (Luhmann, 1989).

Ecological communication and societies' responses parallel the concept of disaster adaptation and mitigation. In responding to the challenges of climate change, other scholars, such as Albert Salamanca and Jonathan Rigg, have also mentioned these categories (Salamanca & Rigg, 2016, p. 282). Mitigation has been widely used to respond to disasters, particularly compared to adaptation,

which is rarely used. Adaptation is defined by the Intergovernmental Panel on Climate Change (IPCC) as the 'adjustment in the natural or human system in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities' (Salamanca & Rigg, 2016, p. 282). In fact, adaptation must be integrated into disaster management. According to Giddens (2009, p. 163), there are two types of adaptation: adaptation after the event (reactive adaptation) and adaptation oriented to possible futures (pro-active adaptation). Pro-active adaptation is a type of adaptation associated with diagnosing and responding to vulnerabilities and needs to be prioritised (Giddens, 2009).

Most of the time, during disaster, impoverished members of the community suffer much more than privileged members due to their limited access to information and other resources. Through adaptation, ordinary people have the power to shape their own solutions to disasters, rather than relying on the authorities and waiting to be evacuated. The concept of adaptation to climate change can be applied to other disasters, and it can be understood through three ideas: (1) risks, threats, and opportunities that societies face; (2) past and present adaptive practices, as well as future adaptive capacities; (3) societal structures and their roles within interactions (Salamanca & Rigg, 2016, p. 283).

Adaptation can also be categorised as physical and non-physical. According to Pittock and Jones (2000), non-physical adaptation includes writing, talking, educating, and awareness raising. Non-physical adaptation also means that communities are communicating, discussing the disasters they face, the causes of these disasters, and how these disasters can be overcome. Meanwhile, physical adaptation in facing disaster (i.e. in the case of tidal flooding) includes raising houses, building sea walls, planting mangroves, etc. Other typologies of disaster adaptation recognise autonomous adaptation and planned adaptation (Munasinghe & Swart, 2005), which resembles the typology of adaptation used by Giddens (2009). In autonomous adaptation, preparation is limited, and adaptation is reactive, undertaken by individuals or private firms without any government involvement (Munasinghe & Swart, 2005). Conversely, planned adaptation is proactive, with good preparation and consideration of the possible effects of disaster (Munasinghe & Swart, 2005).

Communication is vitally important in an Asia-Pacific context, especially in the microstates of Oceania which have, due to their colonial history, in the past relied heavily on Western media sources and perspectives (Crocombe, 2008, p. 31). However, this dependency has been declining in recent years and Pacific micro countries and media have been increasingly looking to their Asian neighbours for their communication needs and inspiration (Crocombe, 2008; Papoutsaki & Harris, 2008; Robie, 2014; Singh & Prasad, 2008). As in Indonesia, environmental issues have tended to get relatively little exposure in mainstream media 'unless we are talking about disasters, such as earthquakes, floods and

cyclones,' lamented conservation consultant Jaap Jasperse while working for the Samoa-based Secretariat of the Pacific Regional Environment Programme (SPREP), an intergovernmental agency established to promote cooperation, support the environment and ensuring sustainable development (Jasperse, 2008). Nevertheless, long-term effects such as global warming and rising sea levels have been rapidly gaining prominence, partly as the result of more awareness of the IPCC reports on climate change, and especially due to Fiji's high profile role as co-chair of the annual UN Framework Convention on Climate Change (COP23) in Bonn, Germany, in November 2017 (Jasperse, 2008, p. 59). Jasperse argues that it is a major responsibility of news media to provide empowering information about disaster risk, climate change and the environment generally.

> Life in the Pacific Islands is very dependent on the quality of the environment for sustaining lives in terms of fisheries and agriculture, and for some exports and tourism. The Pacific remains the main food basket for all who live in it, as well as for surrounding nations [which] come to fish its seemingly plentiful waters. (Jasperse, p. 59)

The most comprehensive study on the communication of the complex issues climate change poses with Pacific Island policy makers, governments, non-government organisations and grassroots communities (Burnside-Lawry et al., 2017) has identified a need to 'bridge the disconnect between science, policy and local level action' in disaster risk reduction and climate change adaptation' (p. 11). In a three-year longitudinal participatory action research (PAR) study (commenced in 2015), Nobel Peace Prize co-recipient Elisabeth Holland of the University of the South Pacific (USP) and the Royal Melbourne Institute of Technology University (RMIT) researchers and their colleagues addressed the challenges of climate change communication at both local (micro) and global (macro) levels. The research project began as 'an examination of local-level methods to communicate climate change' and then evolved into a 'unique intersectoral and interagency network of researchers and practitioners' (p. 12). As the five-member research team describe it:

> All partners are committed to one vision: to facilitate grassroots, upward planning of sustainable climate change adaptation strategies, and to amplify the Pacific Island Countries' perspective of climate change to the world. (p. 12)

The researchers carried out a comprehensive review of climate change regulatory frameworks developed at global and Pacific regional level. They cited a United Nations Office for Disaster Risk Reduction (UNISDR, 2014) warning that the action framework remained largely at 'national, policy development

levels'. The UN findings indicated an '*urgent* need to increase local action in building community resilience to climate-related impacts' (p. 12; Rytz, *Anote's Ark*, 2017). Noting research indicating that the Intergovernmental Panel on Climate Change (see IPCC, 2012) reports continue to 'adopt an information deficit model, or what Paolo Freire termed the "banking model" of education' (Freire, 1970), the Pacific researchers rejected leaving information and behavioural change in the 'hands of the "banker", or expert' (p. 13). The research was conducted using a framework of Communication for Development and Social Change ensuring that 'all participant voices are heard, valued and represented (Manyozo, 2012). It focused on three cycles: 1. A PLAN International Australia (PIA) regional meeting in Nadi, Fiji, which provided the initial impetus for the project; 2. The UN Council of Parties in Paris in 2015 (COP21); 3. The following COP22 in Marrakech, Morocco. However, the article was published before COP23 in Bonn, Germany, in November 2017, which Fiji co-chaired. The article concluded:

> An overarching methodology of participatory action research was used to build a shared understanding of science, history, culture and local context amongst participants (researchers, guest speakers, students and NGO climate change practitioners). The programme established nexus between research and practice to foster inter-agency communication and build trust. (Burnside-Lawry et al., 2017)

Participatory action research was 'deemed essential to amplify the voices of those who have done the least to contribute to climate change, but are the most severely affected, (Dreher & Voyer, 2015; Robinson, 2015; Robie, 2017a)

Methodology

This research uses a qualitative approach, focusing on the process of understanding how communities adapt to maritime disasters. An inductive approach was used in this research, meaning that it is based primarily on the situation or phenomena in the field. However, to ensure the systematic exploration of data, data will be collected in units as determined through the application of relevant and important concepts. Analysed data will be described and explained by connecting it with its context and other elements.

In the case of Semarang, data was collected through interviews, document and literature review, and on-site observation. Interviews and observations were conducted at Kampung Bahari Tambak Lorok in Genuk Subdistrict; Kemijen Village in Semarang; Terboyo Terminal Area, Kaligawe Road in Semarang; and Timbul Sloko Village in Demak. Data on community responses to *rob* flooding was complemented by relevant previous research (Marfai & King, 2008; Harwitasari

& Van Ast, 2011), a documentary titled *Kampung Rob* (Tidal Flood Village),[3] and several documentary videos from YouTube. Interviews were also conducted with some researchers from the Center for Coastal Rehabilitation and Disaster Mitigation Studies (CoREM), Universitas Diponegoro, Semarang. Data analysis has involved describing the adaptations made by communities in dealing with tidal flooding, exploring inductive facts about the situation—specifically the how and why of the situation—and then the proposed solutions and practices.

In the case of Fiji, a review of international development, communication, social planning, and political science literature related to Fiji and Cyclone Winston provides the foundation for the conceptual framework. This is complemented by a media review and interviews with a senior journalist with the regional University of the South Pacific journalism programme, based at Suva, Fiji; the communications officer at USP's climate and environment research agency, and with the leading advocate of 350.org Pacific, a youth-led grassroots network working with communities to fight climate change from the Pacific Islands—popularly known as the 'Climate Warriors'.

Result and analysis

Forms of adaptation on tidal flooding in Semarang

Semarang is an industrial and port city located on the north coast of Java, and it is the capital of Central Java Province. Semarang City consists of 16 subdistricts and 177 urban villages, with a population of 1.7 million people (BPS Kota Semarang, 2016a). Semarang has a coastline of 13.6 kilometres, and most of its coastal areas are affected by tidal flooding to a greater or lesser extent. There are 20 villages along the coast of Semarang; six villages, namely Tambakharjo, Tawangsari, Panggunglor, Bandarharjo, Tanjung Mas, and Terboyo Kulon, suffer the most due to coastal inundation (Marfai & King 2008). In the following map of Semarang (Figure 4), the areas coloured dark blue are those facing the greatest threat of flooding.

The tidal flooding in Semarang and surrounding areas has long been a problem for people of this region (Figure 4). However, the current situation is of higher intensity and more widespread impact. The tidal flooding in this area is not only triggered by rising sea levels, but also by land subsidence, high tides, wave action, and climate change (Harwitasari & Van Ast, 2011, Abidin et al., 2013). Land subsidence in the region is caused by a combination of the natural consolidation of young alluvium soil, groundwater extraction, and the load of buildings and structure (Abidin et al., 2013). Another important factor suspected to cause tidal flooding along the northern coast of Java is the loss of the mangrove forests that previously protected this coastal area from abrasion (Pasotti, 2017; pp. 52–61). In Semarang, tidal flooding is a major threat to urban development and community life (Marfai et al., 2008; Robie, 2017b).

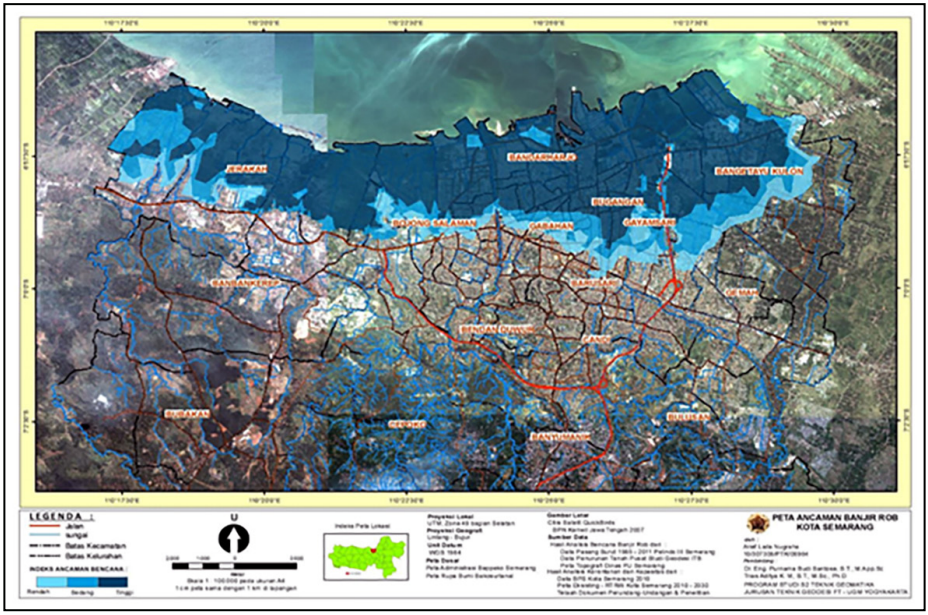

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Figure 4 : Tidal Flooding (*Rob*) area in Semarang.

People affected by tidal flooding in Semarang are unwilling or unable to move to safer places. They choose to stay in their homes for several reasons: limited finances, closeness to the workplace, an owned family home or other property, and/or an expectation to compensate for flooding with adaptive measures (Harwitasari & Van Ast, 2011; Marfai & King, 2008). According to Marfai et al. (2008), the response or adaptation shown by the community in Semarang has mostly taken the form of physical adaptation, such as elevating their houses, raising the level of their floors, raising the level of their yards (around the house), and making small dams to prevent water from entering the house. These community responses are, of course, only short-term or temporary responses. As stated by two residents of Tambak Lorok, Toyo (50) and Suharto (59), almost all residents in this area have raised their houses several times because of the sinking land, the elevated roads, and the worsening tidal flooding. According to Toyo, he has raised his house three times; a similar experience was mentioned by Suharto. Meanwhile, in Kemijen, according to Supardi Warno (the neighbourhood leader, or *Ketua RW*), the average (house) elevation in his village is 3 metres (*Kampung Rob*, 2012). Because of the lack of assistance from the government, the cost of the house elevations must be borne by residents. One resident of Genuk Subdistrict, M. Suyartono (40) conveyed the same thing. 'There is no government assistance to elevate our houses, not in my knowledge. Only assistance to build higher roads'. As a result, some families with little financial capital are unable to raise their homes and must be willing to live in houses that may become flooded.

In addition to physical adaptation, communities affected by tidal flooding also respond through social response. Physical adaptation is usually a result of social responses that have long been built through information or discourse. For example, people often discuss in advance the main causes of tidal flooding in their area and decide to raise village roads or build dikes. Such a decision-making process usually involves community meetings in the village hall. In some cases, people in one area were informed that other areas had managed to solve the flooding problem by cleaning their sewers and drainage canals, and so they decided to do the same thing.

Some residents in flood-affected areas believe that tidal flooding is linked to the location and geographical conditions of the coastal areas, which enables sea water to easily enter mainland areas. Some residents, such as Toyo, who lives in Tambak Lorok Village, actually thinks that river siltation is the main cause of this flooding. Other residents assume that the flooding is caused by a lack of a water pump house in their village. In their daily lives, community members also discuss flooding and argue about the right solutions for overcoming it. Toyo, for example, said that road elevation is not the main solution; rather, a clean sewage system must be realised. In contrast to Toyo, Suharto—who also lives in Tambak Lorok—thinks that road elevation and relocation are the most appropriate solutions to this problem.

Based on their responses towards tidal flooding, people in Semarang and surrounding areas can be grouped into three types: optimistic, pessimistic, and realistic. The optimistic group consists of people who continue to look forward to government assistance and technological aid to solve the flooding. They believe that the government has a crucial role in addressing this problem through infrastructure development policies as well as the implementation of technologies such as polder construction, vacuum pumps, and road elevation. These people expect the government to offer a relocation programme. Another optimistic view is manifested in efforts to replant the mangrove forests. Ironically, optimistic people expect better solutions from the government, such as relocating their homes to higher ground. However, the government seems unwilling or unable to handle this problem. (Muhammad Helmi, interview with the authors, 2017).

Meanwhile, pessimistic people think that this flooding problem is a severe disaster that cannot be solved. The government and other actors are considered to have a non-optimal role in overcoming this problem. According to several residents of Genuk, the flooding cannot be resolved because the government has no interest in doing so. Meanwhile, one resident of Kemijen stated that the 'ruinous' bureaucracy is a complex problem exacerbating the flooding in Semarang (*Kampung Rob*). The Semarang Municipal Government, the Central Javan Provincial Government, and the Central Government have actually come up with several solutions, including road elevation, provision of water pumps,

and even the construction of a sea wall. However, the results have not been optimal, as flooding continues to occur. One pessimist view was expressed by a villager in Genuk:

> I think the government is clever. They said that Sayung (a village in Demak) will be made into a highway. I think the flooding is intentional, made by the government to decrease the price of the land. Because if our land is free from flooding, automatically we can sell it for a higher price, for example, one square meter for Rp 4 million [about US$290]. If it is affected by flooding, it will only be Rp 1 million [US$73]. The government is smart. We are just ordinary people, the oppressed people. (Genuk Villager, interview, 2018)

The last category, the 'realistic' people, are those who think they should live 'side by side' with the flooding. Two factors make people take this approach: 1) People think that the flooding is normal for coastal areas, like Semarang, Demak, and Pekalongan, 2) People feel desperate. Eko (39), a resident of Batursari Village in Semarang, said that since childhood he had learned that the northern Semarang region, from the old town to the port area of Tanjung Mas, had indeed frequently suffered from flooding. He said, 'In my opinion, coastal areas like Semarang are indeed commonly affected area by *rob* flooding' (Eko, interview, 2018). In Kemijen, areas affected by flooding have been transformed into pools for fish farms, which are managed together by residents, who use their profits to fund the local early childhood education centre. Another form of adaptation intended to mitigate the effects of the flooding is the planting of mangroves along the northern coast of Java. Those who previously worked as fishermen have instead become mangrove farmers. Some have been helped by non-governmental organisations, corporations, and universities to replant mangroves in the area. These people have also developed mangrove-based economies, using mangrove batik, mangrove-based food products (such as flour, snacks, and syrups), and mangrove seedlings.

Another issue exacerbating the flooding in Semarang is garbage (Figure 3). In areas experiencing flooding such as Tambakrejo, piles of garbage can be seen around residents' homes. In some places, industrial waste can be found in flood prone areas. As such, independent waste management, industrial awareness of the need for better waste management, and government intervention in waste management systems are necessary to address the complex issues underlying the flooding.

Social adaptation to flooding in Semarang has also been coloured by potential conflict between residents. This conflict is not large-scale physical conflict, but still has the potential to inhibit the resolution of the acute flooding problem. In the fishing village of Tambak Lorok, for example, residents expressed different views of the flooding problem and its resolution. One resident even said: 'The

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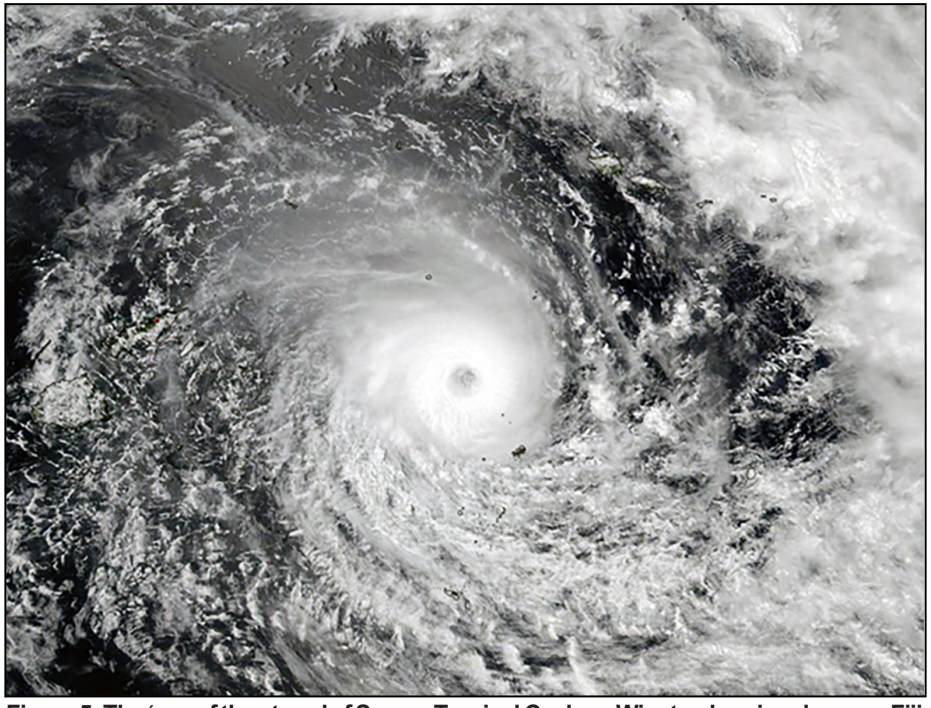

Figure 5: The 'eye of the storm' of Severe Tropical Cyclone Winston bearing down on Fiji.

people here are hard-headed; the government has tried to help but they've rejected it. …. So there's no need to help the people here… just help the government' (Tambaklorok villager, interview, 2018). Meanwhile, one resident of Bandarharjo said that 'now our neighbours don't care about our conditions; everyone is on his or her own' (*Kampung Rob*, 2012). A different situation can be seen in Kemijen, where residents routinely work together to raise the roads or clean the village.

Social adaptation of Tropical Cyclone Winston in Fiji

Cyclone Winston was the worst storm in Fiji's recorded history. On 20-21 February 2016, Category 5 Severe Tropical Cyclone Winston cut a swathe of destruction across the Fiji Islands. It built up in intensity after forming near Vanuatu on February 7, striking Tonga and then doubling back to hit Fiji with its full intensity and a sustained wind force of 280km/h in 10-minute gusts. The Fiji government estimated that almost 350,000 people—or more than a third of the country's total population—living in the cyclone's path may have been affected (some 180,000 men and 170,000 women). The National Disaster Management Office (NDMO) coordinated relief efforts and activated National and Divisional Emergency Operations Centres (EOCs) around the country. Communications were temporarily lost with at least six islands and some remained cut-off for two days after the cyclone. A 30-day State of Natural Disaster was declared and

this was extended for a further month until April 20. At least 44 people were confirmed dead and some 56,000 people were sheltered in evacuation centres. Estimated total damage was F$2.98 billion (US$1.4 million). Both Australia and New Zealand provided logistical and financial aid (After tropical Cyclone Winston, 2016). Indonesia also provided aid and supplies and later, in May, send a contingent of soldiers to Fiji to help with the rebuilding of schools (Perwarta, 2016).

Reporting after the initial month-long emergency, Dionisia Tabureguci of *Business Melanesia* (2016) wrote that as Fiji picked up the pieces after Tropical Cyclone Winston's ravaging impact in late February and March, 'tourism and remittances are standing by as white knights' for a struggling economy. Tabureguci praised the Fiji government's response over the nation's infrastructure and noted there was also quick reaction to the widespread destruction of homes and dwellings in affected areas with the Fiji National Provident Fund (FNPF) offering its more than 300,000 members withdrawal assistance of up to F$5000 on special grounds. The commercial banks also offered low interest rates loans with the assistance of the Reserve Bank of Fiji (RBF). Bank governor Barry Whiteside was quoted as saying:

> That won't make them have a whole house but it will help them repair and put a roof over their heads. And if they add that together with what they can get from FNPF if they're an FNPF member, they can get up to $10,000 and I think that goes a long way in helping them at least make repairs to their homes. (Tabureguci*, 2016)*

While the world was busy celebrating Women's Day on March 8, in Fiji many women from the diverse ethnic communities—the majority of indigenous Fijians, Hindus and Moslems, and mixed-race Polynesians—were struggling for their basic needs. 'In my community, I want to see improved infrastructure including proper crossings and bus shelter,' said a woman from Lautoka, Alecy Amua, who was worried about children's safety. Antonio of Suva, who was concerned about the violence and bullying in the communities that encouraged suicide, said to counter this situation, 'I want young people to access training and the support they need. However, the irony was that the women's voices were unheard, leading to major social issues (Dhabuwala, 2016).

In a series of insightful editorials, *The Fiji Times* editor-in-chief, Fred Wesley (2016), wrote that the people of Fiji were largely prepared for Cyclone Winston, but they were simply overwhelmed by the 'raw power and strength' of Winston and the massive devastation caused.

> No one was prepared for Winston's average winds of up to 220km an hour and momentary gusts of up to 315km an hour close to its centre. That

> was terrifying strength that turned Winston into a fully-fledged Category 5 mega-storm…
>
> Because we are a country prone to such natural disasters, perhaps that has ingrained in us a sense of acceptance of our fate, and of cyclones in general. That has now changed in the wake of Winston. (Wesley, 2016)

Eight days after Cyclone Winston struck Fiji, 350.org Fiji coordinator George Nacewa, Australian photojournalist Jeff Tan and Pacific Climate Warrior advocate Fenton Lutunatabua visited three different families from Navoci Village, Korovuto Settlement and Vatukoula. In an interview via social media, Lutunatabua (2018) directed the authors to their 'beyond the narrative' accounts of the disaster. As storytellers, argued Lutunatabua, it is important to 'honour stories and people by sharing a more in-depth, nuanced truth'. For example, rather than telling another story about 'the destruction, the despair, and the sorrow', he preferred to tell stories 'about the aspirations of our resilient nation. One that focuses on how faith and community will be at the core of rebuilding our beloved Fiji'.

Among the collection of stories, Mohammed Shazil recalled:

> The night TC Winston hit our area, we were in [another house] up the hill carrying out our 'bhajan' [sharing]. As we were wrapping up our prayer for the evening, a roofing iron crashed into the lounge. We learned later that it was the roofing iron from my neighbours' home. They lost their roof and having no roof throughout the entire ordeal meant that everything they owned inside their home was destroyed. I felt sorry for them, they were barely making ends meet. Their three daughters were all in primary school, and now they [have] just lost all their possessions, what are they supposed to do now? We are helping them rebuild. (Lutunatabua, 2016)

Salome Pareti recalled:

> I was already overdue. I was meant to give birth on February 14, so I was worried that I would go into labour during the height of Tropical Cyclone Winston. Imagine that night, the winds were so strong that whenever I needed to go to the bathroom, my husband had to hold my hand and lead me so I wouldn't get blown away. On top of that, the rain made everything so slippery and it was so dark I couldn't see where I was going. I am so glad I didn't go into labour that night. If I did, my husband [would have] had to run to the fire station to get me [transport] because there was no signal on our phones. (Lutunatabua, 2016)

Romeo Kivi recalled:

> Locked up inside our home, we couldn't do anything else but pray. As soon as we heard the warnings, I [caught] the bus to the town and bought things to see us through Cyclone Winston. A torch, some batteries, candles and tinned food items. We tried to prepare ourselves the best we could.

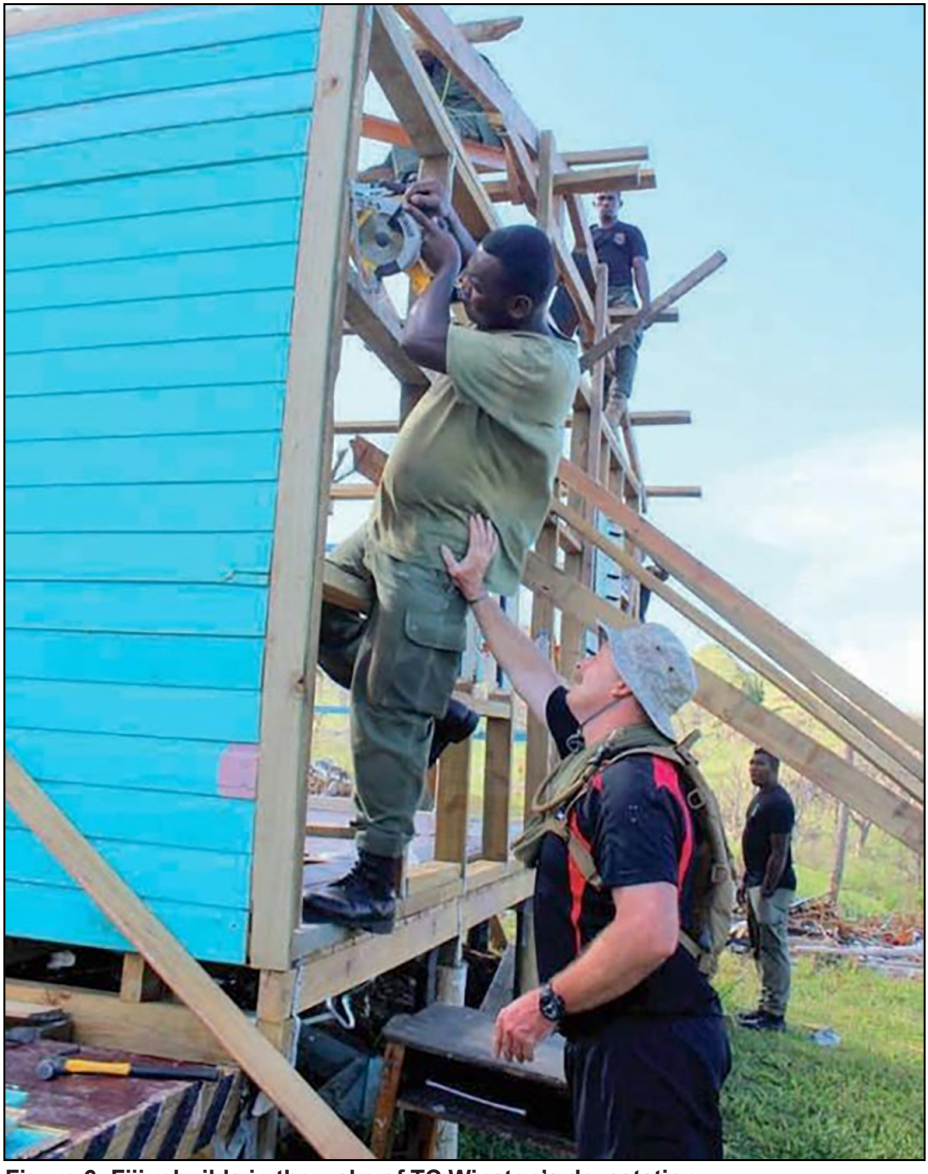

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Figure 6: Fiji rebuilds in the wake of TC Winston's devastation.

> I had spoken to my two sons and told them, when I say run, don't run to the neighbours, run underneath the house and seek shelter. (Lutunatabua, 2016)

Reflecting two years on from the disaster, journalism coordinator Dr Shailendra Singh (interview with authors, 2018) at the University of the South Pacific, acknowledged that Fiji communities had taken heed of the warnings. The major method of communication in Fiji is mainstream media—broadcast, print,

online and social media. However, because of the relative costs, print and online media is limited.

> Radio is more widespread. Word-of-mouth is also important, especially in remote villages and scattered maritime areas, where mainstream media penetration is low, partly due to infrastructure and partly due to affordability. (Singh, interview, 2018)

Based on her own personal experience and observation, communications officer Sarika Chand of USP's climate research agency Pacific Centre for Environment and Sustainable Development (PaCE-SD), said the first week after the cyclone struck 'left most people stunned—while still making sense of the extent of the damage, the community was pretty shaken' (Chand, interview, 2018). She said people were also 'in overdrive' helping collect food, blankets, essentials and money from Suva and other places not so badly hit and delivering them to 'drop-off' places in the badly hit zones.

> Stories of those badly affected by Winston came out shedding light on their resilience during the tough times – children playing in areas stripped of everything. Families spending cold nights in tents or under the stars. It was an emotional yet encouraging time for the whole country … Around the tanoa of grog [bowl of kava], at poetry slams, at university seminars, TC Winston was the most discussed and analysed topic for months. There was a running hashtag #StrongerThan Winston. Musicians collaborated to give the nation hope to continue with rebuilding. (Chand, interview, 2018)

According to Singh, the Fiji community took necessary precautions to build and store food supplies in advance of the cyclone and secure their belongings, including dwellings. However, the problem was that in rural areas, and in densely populated peri-urban areas, the dwellings are quite 'flimsy construction, especially in squatter and informal settlements'.

> The people can only do so much to safeguard themselves. Their poverty makes them extra vulnerable. Mostly they hope and pray [that] they survive the worst of any storm. Cyclone Winston with Category 5 winds was the worst, and did not spare anything in its path. Many people lost everything. Despite government efforts and the generosity of aid donors and individuals, the recovery is incomplete because of the sheer scale of the devastation. (Singh, interview, 2018).

In both mainstream and social media, village settings and community gatherings, the sheer strength and ferocity of the cyclone was a common topic for discussion. While the media warned that a strong Category 5 cyclone was bearing down on them, for most people that was insufficient information. They had little idea about what physical strength of the cyclone to expect or what kind of damage it was capable of inflicting. Singh observed:

> This is one of the problems when it comes to communicating information about cyclones to the community. People are trying to make sense of why we are hit by hurricanes of such magnitude. The possible link with climate change is being discussed. People have been telling stories of close escapes. (Singh, interview, 2018)

According to Finau et al. (2018) in a post-Winston study, while social media did not replace traditional communication or media, it demonstrated 'innovative and serendipitous uses' ranging from informing citizens, sharing experiences and as a 'rallying point': 'Social media has created a space for Pacific Islanders' voices to be heard and the severity of Cyclone Winston being a consequence of anthropogenic climate change'.

As a consequence of Cyclone Winston, the Fiji community has hopes for better warning systems, more shelters—and better-equipped ones, faster rehabilitation processes and delivery. Schools and homes need to be reconstructed quickly (Robie, 2017b). Help is needed with the rehabilitation of farms. In the longer term, there is a need for proper housing support for squatter and informal settlements, the most vulnerable group.

The poorest communities are limited over what they can do to reduce the impact of a disaster such as they experienced. They do not have the means to build viable shelters, or to rebuild fully and quickly after a disaster. They are forced to rely on outside help. Community and volunteer groups and non-government organisations assist. They also play a crucial role in early responses and in supplementing government efforts.

Discussion

The tidal flooding in Semarang and Tropical Cyclone Winston in Fiji have been disasters with different characteristics. The tidal flooding was gradual and continuous, with the situation becoming worse over time. Meanwhile, tropical cyclones (such as Winston in Fiji) are sudden, with little warning, and have massive and readily visible destructive effects. However, they are similar in that they have caused significant material and non-material damages to local communities and affected areas. Meanwhile, in terms of adaptation, although these disasters have different characters, both have required a similar extent of adaptation. Both disasters would have ideally required a pro-active, planned, and multi-dimensional approach to adaptation (both physical and non-physical) rather than a reactive, autonomous, and partial one. However, the situations in both Semarang and Fiji were far from ideal.

The tidal flooding in Semarang has forced communities to undertake more gradual or long-term adaptations. For the people of Semarang, this is shaped by the lack of a direct solution. The situation in Semarang has indicated that adaptation has only been partial. Some areas are free of tidal flooding, while

others are continuously under water. The fact that this tidal flooding is caused by multidimensional factors can also be attributed for the sub-optimal adaptation measures undertaken. Meanwhile, Tropical Cyclone Winston forced the affected community to adapt quickly to a sudden destructive event, which resulted in a need for greater mental capacity to be built rapidly. Those who fell victim to the cyclone were highly vulnerable to intense psychological trauma. However, disasters such as cyclones and tsunamis also require long-term, planned adaptation to minimise future material and non-material damages. Ultimately, it was the communities that suffered because of a rapid decrease in their quality of life as a result of living in temporary shelters or swamped homes.

In terms of other risks, threats, and opportunities that communities face, the tidal flooding in Semarang has had complex social effects and risks. Communities have faced migration because of villages being underwater and unsalvageable, health problems resulting from environmental issues, as well as other social issues. Affected communities, living in poor economic situations, have not been able to improve their quality of life, as they must regularly think about elevating their homes to counteract the rising tides and land subsidence. Tidal flooding has created an unhealthy environment, and it is happening to people who have little choice but to put aside their health issues to stay in the area. The dirty water that floods homes every day brings much waste, which is very harmful to community health. Similarly, communities face constant economic loss as an inevitable risk of staying in the region.

In the case of Cyclone Winston, adaptation to other risks, threats, and opportunities has been informed primarily by the sudden onset of the disaster. The high level of damage to rural villages and subsistence crops and the sugarcane industry, as well as destruction of property, resulted in communities being forced to live in temporary shelters. The greater the ability to anticipate a disaster, the greater the possibility for reducing or mitigating its effects and for developing potential solutions. The Finau et al. (2018) study demonstrated how important social media was in communication.

In relation to past and present adaptive practices, and future adaptive capacities, both disasters show different characters. In the case of the tidal flooding, the disaster has been gradual, occurring slowly over a long period of time. Therefore, the community's adaptation to risks and threats has improved over time. Moreover, the community believes that the tidal flooding must be accepted as a risk of living in a coastal area. Consequently, discourse has normalised the phenomenon. Tidal flooding is considered normal and unavoidable, and some have even chosen to stay, continue to build new homes, or elevate their homes. It shows that the community still has hopes and opportunities. However, adaptation seems to have become increasingly difficult as the situation has deteriorated. In this context, mitigation is needed to save the community. Today's adaptations are

closely linked to the community's expectation that technological interventions can help them stay in the area. In the case of Fiji, factors such as better housing design and structure, and more and stronger community shelters, are critical.

In relation to societal structures and the roles of social actors, in Semarang the relations between actors are less coherent. The government lacks any clear ideas about and policies regarding disaster management in the region. Each stakeholder has a different solution, which has led to the situation becoming more complex. Owing to this lack of structure, communities affected by flooding have become victimised, increasingly marginalised and disempowered in facing the complex problem of maritime disaster. Local communities have become suspicious of the government's motives and activities to mitigate disaster. The unclear social structure has also caused unclear role division. In the case of Cyclone Winston, many actors were involved in post-disaster recovery, including the government, local non-governmental organisations, and foreign aid agencies. However, the greatest challenge for the future will be offering a comprehensive solution involving clear strategies, mitigation and disaster-risk plans. Thus this will mitigate any threats to the recovery mechanisms.

Conclusion

Adaptation is closely related to ecological communication, which must be understood as the key to the operation of the social system. Communication plays an important role in promoting 'resonance' as a form of reaction and response to disasters among social sub-systems, as shown in the case of Fiji with social media complementing traditional communication. In the two cases discussed here, there has been strong resonance involving both political and social systems. The resonance of the political system in dealing with disasters can be noticed in the disaster management mechanisms used, which must involve various actors from diverse platforms to promote the interests of disaster victims. Communication has enabled communities to address the disasters they face.

In the case of tidal flooding in Semarang, ecological communications have shaped the rationalisation that living in an area prone to tidal flooding is not problematic. This view has created a relatively stable resonance, one that has continued to reaffirm the rationalisations in the communities. In Fiji, communications have functioned to address the sudden transformations caused by rapid destruction as well as the subsequent evacuation and damage to rural villages and communities. As a result of the abnormal situation, ecological communications had to resonate quickly to address their situation. Communication is in a race against time, and where it fails it must attempt to rationalise the view that disaster is unavoidable and that significant time is necessary for recovery or to find a solution.

Within communities, failure in ecological communications will result in

limited resonance among relevant social systems as well as poor planning in disaster management. In these cases, autonomous adaptation is more apparent than planned adaptation. Affected communities, which are generally poor ones, are forced to endure through their own financial capacity owing to the limited structure and short-term orientation. This indicates that the ability to adapt to disaster at all levels in society is required not only in affected communities, but also in local governments and even external parties. In this situation, communication—as an operation of the social system—will determine the community's ability to adapt and extricate itself from and provide a solution to the maritime disasters faced.

Notes

1. The 'ring of fire' is a 40,000 kilometre long, horseshoe-shaped zone with more than 50 active and passive volcanoes and volcanic belts where more than 90 percent of the world's earthquakes take place. Retrieved from https://en.wikipedia.org/wiki/Ring_of_Fire

2. The Pacific Islands Forum (PIF), with a secretariat in Suva, Fiji, was founded in 1971 with the original name of South Pacific Forum (SPF). The 18 member countries currently are: Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. Tokelau is an associate member, and American Samoa, Guam, Northern Mariana Islands, Timor-Leste, and Wallis and Futuna are observers. Source: Forum Communique (2017), 47th Pacific Islands Forum, Pohnpei, Federated States of Micronesia. 8-10 September 2017. Retrieved from http://www.forumsec.org/resources/uploads/embeds/file/2016_Forum_Communique_11sept(1).pdf

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