Conducive and hindering factors for effective disaster risk reduction in Emae Island, Vanuatu

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Abstract

Vanuatu is one of the most hazard prone nations in the world and frequently tops the World Risk Report as the nation with the highest overall disaster risk. The devastation wrought by category 5 cyclone Pam (2015), the El Niño drought (2015/16), and volcanic eruptions in Ambae (2018), are but a few recent examples of disasters which have disrupted livelihoods and curtailed development. The Vanuatu government, along with financial and other support from the international community, has over time developed and implemented a variety of disaster risk reduction strategies. Based on recommendations from the Hyogo Framework for Action (2005-2015) and the current Sendai Framework (2015-2030), these strategies have included: the decentralisation of disaster risk management; capacity building through enhanced collaboration with international non-governmental organisations; the formation of community disaster and climate change committees; and improved risk mapping, early warning and communications systems. This study evaluates the progress of some of these identified strategies implemented at the national, provincial and local levels based on the perspectives of government officials and drawing on an empirical case study from Emae Island. While on paper Vanuatu has made significant progress in developing a conducive environment for reducing disaster risk many issues remain. For example, some conducive factors include stakeholders from all levels being aware and accepting of both local and scientific knowledge and the importance of both top-down and bottom-up strategies. However, hindering factors include a lack of communication between levels and a preference for scientific knowledge at the expense of local “traditional” knowledge, among other examples. As such, this paper helps illuminate both conducive and hindering factors for developing local disaster risk reduction strategies in Vanuatu in a world of increasing disaster risk.

1. Overview of key issues and literature

Vanuatu is an archipelago of 83 islands of volcanic origin, with a total land area of 12,281km^2 spread over 360,000km^2 of ocean between 12° to 23° south and 166° to 173° east in the Southwest Pacific (SPC 2013). Of the 83 islands, 63 are permanently inhabited, and the total population of Vanuatu is estimated to be ~289,700 (SPC 2016). Vanuatu was previously known as the 'New Hebrides' but formally gained independence from the Anglo-French condominium government (1906-1980) in 1980 and is a nascent liberal democracy. Although still considered a least developed country (LDC) by UN indices, Vanuatu is set to achieve developing country status by 2020 (UN, 2018).

Throughout Vanuatu, reducing disaster risk has been a central part of people's livelihood strategies and diverse cultures for thousands of years. This adaptation imperative has been driven by people's high exposure to natural hazards such as cyclones, droughts, earthquakes, tsunamis, king-tides, floods, and volcanos, coupled with a high dependency on vulnerable livelihood sectors such as agriculture, coastal resource collection (e.g., crustaceans) and fishing (Lebot and Siméoni 2015, McNamara and Prasad 2014). Nonetheless, resilience, broadly conceptualised as a range of absorptive, adaptive, and transformational capacities (Béné et al. 2015), can be observed from the strategies employed by communities confronting and managing risk (Campbell 1990; 2006, Jackson et al. 2017, Lauer 2012, Lebot and Siméoni 2015, McNamara and Prasad 2014, Spriggs 1981, Walshe and Nunn 2013). For example, elaborate kinship and trading networks (as a form of social security) along with food system adaptations (e.g., crop choice, redundancy, preservation and storage), resilient building design and construction, and early warning systems (i.e., ecological indicators) are some traditional practices observed throughout Vanuatu communities (Campbell 1990, Spriggs 1981, Walshe and Nunn 2013).

Ni-Vanuatu people have displayed considerable agency and creativity in adapting to the rapidly changing social, political, economic, and environmental conditions of the 19th and 20th centuries[1] (Connell 2010, Jupp and

[1] The story arc of modern Vanuatu goes along the lines of: first brief contact by Portuguese (1606); British and French exploration (late 1770s); trade and resource extraction (1820s-onwards); missionaries (1850s onwards); blackbirding (1850s-early1900s); British/French condominium rule (1902-1980); and independence (1980-present). Each of these periods influenced the character of modern Vanuatu. Christianity, private property and markets, and western conceptions of progress have interacted and syncretised with traditional systems with implications for disaster risk reduction.

Sawer 2008, Thompson 1971). However, processes captured under the umbrella term global change (e.g., climate change, land use change, economic globalisation, population growth) are widely considered to be driving increasing disaster risk throughout the Pacific (Barnett 2010, Cai et al. 2012, Lalit and Subhashni 2015, McIver et al. 2016). The field of analysis and management that reduces the causal factors of disaster risk is Disaster Risk Reduction (DRR) (UN/ISDR, 2015).

For DRR to address "causal factors" of risk, however, depends on the conceptualisation of causality used by actors to identify the processes and factors that lead to expressions of disaster vulnerability which are diverse and multidimensional in nature. While some still argue that vulnerability can only be in relation to a threat (e.g., hazard), others contend vulnerability is the chronic pre-existing societal conditions and seek to identify its root causes (Blaikie 1994, Ford and Smit 2004, Kelman et al. 2015, Oliver-Smith et al. 2016, Ribot 2014, Watts and Bohle 1993). These studies ask: "why are certain social groups and places more vulnerable to environmental change or hazards?" In disaster studies, it is widely accepted that the answer to this question is, "geographically, because they live in marginal, hazard-prone areas; socially, because they are poor; and politically, because their voice is disregarded" (Gaillard and Mercer 2012 p.173). The distribution of vulnerability in Vanuatu typically follows this pattern, although highly exposed, poor, and politically weak communities may still be resilient due to, for example, strong informal social protection (e.g., Ratuva 2014) and traditional knowledge and practice (e.g., Campbell 1990).

While it is recognised that vulnerability stems from underlying societal processes there remains some contention as to the most effective means of addressing these processes and their symptoms (e.g., Fuller and Pincetl 2014, Oliver-Smith et al. 2016, Ribot 2014, Smit and Wandel 2006). The two most common approaches for DRR are top-down (e.g., international, regional and national policy and implementation strategies) and bottom-up (e.g., community driven actions or engagement with communities when devising policy). There is now a significant literature that explores these two approaches with a key insight being the need for complimentary actions from both levels rather than one or the other as they are not mutually exclusive (Gaillard and Mercer 2012, Wisner et al. 2012). Historically, disaster management has been driven by command and control actions based upon structural and behavioural adjustments, nevertheless, increasing disaster risk over the latter half of the 20th century revealed the inadequacies of relying on top-down, often technocratic, management strategies alone (Gaillard and Mercer 2012). Conversely, and of relevance to Vanuatu which is a small, dispersed, and culturally and socially non-homogenous society, bottom-up approaches have gained currency in the literature. A key finding is

that community driven DRR based on local knowledge, such as the examples introduced above regarding traditional knowledge in Vanuatu, can be highly effective at reducing disaster risks (Gaillard and Mercer 2012, Kelman et al. 2015).

While this paper is specifically about DRR, the overlap between DRR and climate change adaptation (CCA) should be noted, as they are both conceptualised as reducing vulnerability against current or future environmental risks. It is now widely accepted that DRR and CCA should be approached under the umbrella of development that targets the root causes of vulnerability such as poverty, political voicelessness, and exposure, among many other factors. Like the DRR literature, CCA studies have shown that bottom-up strategies can reduce vulnerability by empowering communities and drawing on their existing pool of highly localised and attuned socio-ecological knowledge and practices for responding to sudden (e.g., cyclones, flooding) and slow onset (e.g., sea level rise, increasing temperatures) hazards (see Dodman and Mitlin 2013, Remling and Veitayaki 2016).

Another further contention with DRR and CCA lies within the domain of knowledge. Typically, this has been framed as a dichotomy between local and scientific epistemologies (Gaillard and Mercer, 2012). As with the debate between top-down and bottom-up approaches, it is now recognised that a symbiotic approach that recognises the benefits and limitations of each is required (Mercer and Kelman 2010). Studies have shown that local understandings of climate, ecology, and hazards can complement scientific advances in knowledge and management of hazards (Gaillard 2007, Gaillard and Mercer 2012, Kelman et al. 2012). Nonetheless, as we will explore throughout this paper conflict exists between the two types of knowledge which is arguably hindering progress in DRR.

Finally, issues of scale remain vitally important and international, regional, national, and local level actors and their actions need to be part of the solution to reducing underlying vulnerability. Processes such as economic globalisation and climate change and their deleterious localised temporal and spatial expressions cannot be confronted at only one scale or level because their drivers are inherently cross-scale and cross-level (e.g., Cash et al. 2006). For example, limiting catastrophic climate change through mitigation must be primarily dealt with between states and national policies, but the sub-national and local levels are inevitably where community adaptations need to take place.

The United Nations International Strategy for Disaster Reduction (UNISDR) acknowledges that treating causal factors of risk are required to reduce escalating disaster costs and Vanuatu is a signatory to UNISDR

frameworks. As such, the Vanuatu government with the support of its regional partners, has been working towards developing national DRR policy in line with recommendations proposed in The Hyogo Framework for Action (HFA) (2005-2015) and the current Sendai Framework for Disaster Risk Reduction (SFDRR) (2015-2030). Some developments and strategies include but are not limited to: treating risks in planning and development also known as "mainstreaming" DRR and CCA through sustainable development processes; the decentralisation of DRR (top-down and bottom-up) including greater collaboration with international non-governmental organisations and the communities themselves; and enhanced risk mapping, early warning and communications systems.

1.1 Research question and aim

The purpose of this study is to contribute to the UN Global Assessment Report on Disaster Risk Reduction 2019 (*GAR), which is a* biannual report published by the UNISDR that compiles "worldwide efforts to reduce disaster risk". There are four chapters[2] in GAR 2019, and we contribute specifically to chapter 3 which is titled, *'Creating the national and local conditions to manage risk'*. To drive our analysis, we ask the following overarching research question: What are the conducive and hindering factors in developing local disaster risk reduction strategies and their effectiveness? To answer this question, we draw from Gaillard and Mercer (2012) in which they persuasively argue that a critical hindering factor leading to poor outcomes in local DRR is a gap between knowledge and action (i.e., high quality information regarding DRR in diverse contexts yet consistently poor outcomes from actions). The authors suggest this knowledge-action-gap can be addressed by researchers and practitioners: "1) recognizing that different forms of knowledge [local and scientific] are valuable in addressing disaster risk; 2) that actions at different scales, from the top-down and from the bottom-up, are necessary to reduce the risk of disaster in a sustainable manner; 3) and, that both previous points require an active engagement of diverse stakeholders operating across different scales to collaborate" (Gaillard and Mercer 2012: 95). Using these three proposed conditions for effective DRR governance and action, among other factors, this

[2] Implementation of the Sendai Framework for Disaster Risk Reduction and disaster risk-informed Sustainable Development; 2) Global risk trends; 3) Creating the national and local conditions to manage risk; and, 4) Introducing the hazard and risk scope of the Sendai Framework.

study aims to identify and qualitatively evaluate the state of local Vanuatu DRR drawing on a case study on Emae Island.

2. Methods and study site

In this study, we utilised a range of qualitative methods: semi-structured interviews (14), informal discussions (80+), and participant observation in Port Vila and Emae Island, Vanuatu, between January-March 2016. As we have outlined data collection methods in greater detail elsewhere (Jackson et al. 2017), here we provide a brief overview before introducing the study site and context.

Data was collected throughout Emae communities (e.g., Tongamea, Makatea, Safuti, Sangnava) (Figure 1) and around the national capital Port Vila (e.g., various ministries and departments and people). The lead author interviewed the following stakeholders: five Emae Island key disaster informants (health, education, nongovernmental organization (NGO), disaster committee, and disaster chairperson, all male); five Vanuatu national and provincial informants (responsible for Emae DRR, two males and three females); and four leaders of NGOs and intergovernmental organizations (all familiar with Shefa Province, all male). Questions regarding DRR were asked along the lines of how it operates and is understood, and common problems and progress themes. Questions were specifically tailored to capture the informants' individual experiences in their fields. Informants have been numbered to enable the tracking of responses: 1-5 are Emae stakeholders, 6-10 are government stakeholders, and 11-14 are NGO stakeholders.

While semi-structured interviews worked well with DRR stakeholders, informal discussions (80+) (in Bislama "Storian") proved to be the most effective way to elicit useful community information in Emae due to alignment with the sociocultural context where people prefer informality in the exchange of information, ideas and stories (see Vaioleti 2006). Furthermore, these informal discussions were often "group discussions" over meals, after church, or when visitors came into villages.

All qualitative data collected (e.g., interviews, journal notes) were analysed using NVivo and only the most prominent themes from interviews, informal discussions, and participant observation are included in the results. Quotes are used to represent wider themes.

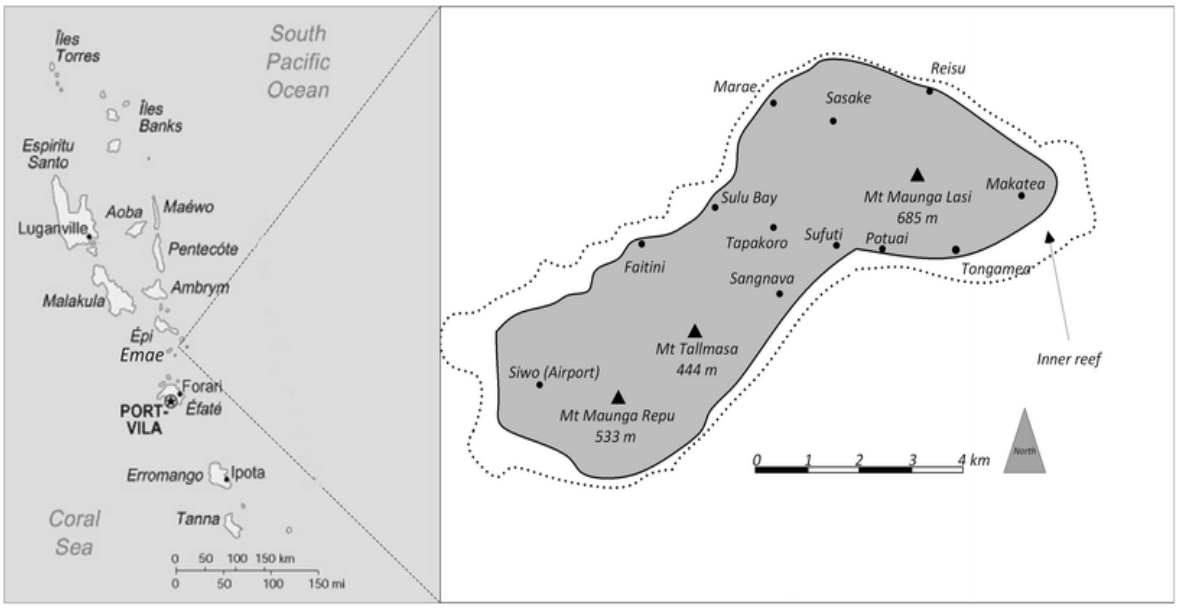

Figure 1: Emae Island location in relation to Vanuatu and a map of Emae including locally derived names of villages and mountain (Jackson et al., 2017).

Emae Island is located 17° 40S and 168° 240E in Shefa Province, Vanuatu (Figure 1) and is part of the Shepherd Islands, including Emae, Mataso, Makura, Tongariki, Laika, and Tongoa. Emae is relatively small (32 km^2) and of volcanic origin with three large mountains in the interior, the largest being Maunga Lasi (685 m). The villages are primarily located around the coastal fringe. The population sits at ~900 people although this fluctuates significantly with intra-and-interstate migration and returns, however population was perceived by locals to be increasing. Emae inhabitants speak a Polynesian derived language called Fakamae (Capell 1962) although all speak Bislama, the national creole English language. Primary livelihood strategies are coastal resource collection, subsistence agriculture, and remittances. Cash income generation is increasing in perceived importance and is derived through the export of fish and crops to Port Vila and remittances. Recent disasters, cyclone Pam in March 2015 and the El Niño drought (2015/16), have detrimentally affected livelihood strategies on Emae, with a perceived greater need for aid from donors. Emae shares some similarities with rural islands in Vanuatu that have limited tourism, are politically weak, and have sustained contact with NGOs. Importantly, traditional custom governance is still strong, although rapid social and cultural change is continuing to take place, which has been identified in other rural parts of the country (Westoby 2010). As such, Emae may, with caution, be used as an example of other islands in Vanuatu that share these characteristics. However, Emae's relative proximity with Efate and accessibility by plane and ships/boats must be considered.

The remainder of the paper is as follows. First, we draw from primary and secondary sources to outline Vanuatu's DRR governance structures that have been in development since 2011 specifically focusing on national, provincial and local levels. Second, we explore stakeholders' perceptions to assess whether traditional/local and scientific/global knowledge is being considered. Third, we identify DRR strategies and consider whether they are both top-down and bottom-up, at all scales; Fourth, we present the five key hindering factors identified during the previous three sections and some novel data. Lastly, we briefly provide some suggestions on how to further make the national and local conditions conducive for local DRR strategies and effectiveness. While the study was analytical, we nevertheless present the data in a qualitative narrative style and embed the discussion throughout.

3. A brief outline of Vanuatu's DRR governance systems' regional, national, provincial and local level actors

As outlined by the UNISDR, DRR is primarily a responsibility of national governments, yet international and regional partnerships, frameworks, and actions remain important for DRR at all levels (UN/ISDR 2015). A key national stakeholder stated Vanuatu's main regional partners were "*France, Australia, and New Zealand. Three big ones*," along with data sharing arrangements, among other types of support, from the "*UN, SPC [Pacific Community], SOPAC*[3] *[*South Pacific Applied Geoscience Commission*], based in Fiji (interview 10)".* International partners (e.g., Aid agencies) invest in DRR, for example, through helping devise, fund and support programmes and strategies such as the UNDP's "*Pacific Risk Resilience Programme*" (PRRP) and the "*Strategy for Climate and Disaster Resilient Development in the Pacific 2016*", in addition to general science capacity such as forecasting and expertise from organisations such as CSIRO (Australia), and NOAA (U.S.). Nonetheless, most stakeholders acknowledged that assistance is typically in the form of humanitarian assistance after large scale disasters such as Cyclone Pam in 2015 and the 2015/16 El Niño drought (interviews and informal discussions). This complex contribution of institutions is shown in Table 1, which identifies key international and national frameworks and strategies in Vanuatu.

[3] SOPAC is now part of SPC.

Table 1: International and national frameworks and strategies in relation to DRR.

International/regional	National
SFDRR	Vanuatu Climate Change and Disaster Risk Reduction Policy 2016-2030
UNFCCC agreement e.g., Paris, Warsaw International Mechanism: Loss and damages	Vanuatu's National Climate Change Adaptation Strategy (years?)
Sustainable Development Goals	National Sustainable Development Plan (2016-2030)
Strategy for Climate and Disaster Resilient Development in the Pacific (SRDP) 2016	Planning and development frameworks (e.g., Vanuatu Country Planning Framework 2017-2021)
Pacific Risk Resilience Programme (PRRP)	Emergency plans such as the National cyclone support plan (2016-2017) (years?)

3.1 National level

The national coordination structure is shown in Figure 2 and outlines the significant changes that have occurred with the decentralisation of responsibilities since 2011.

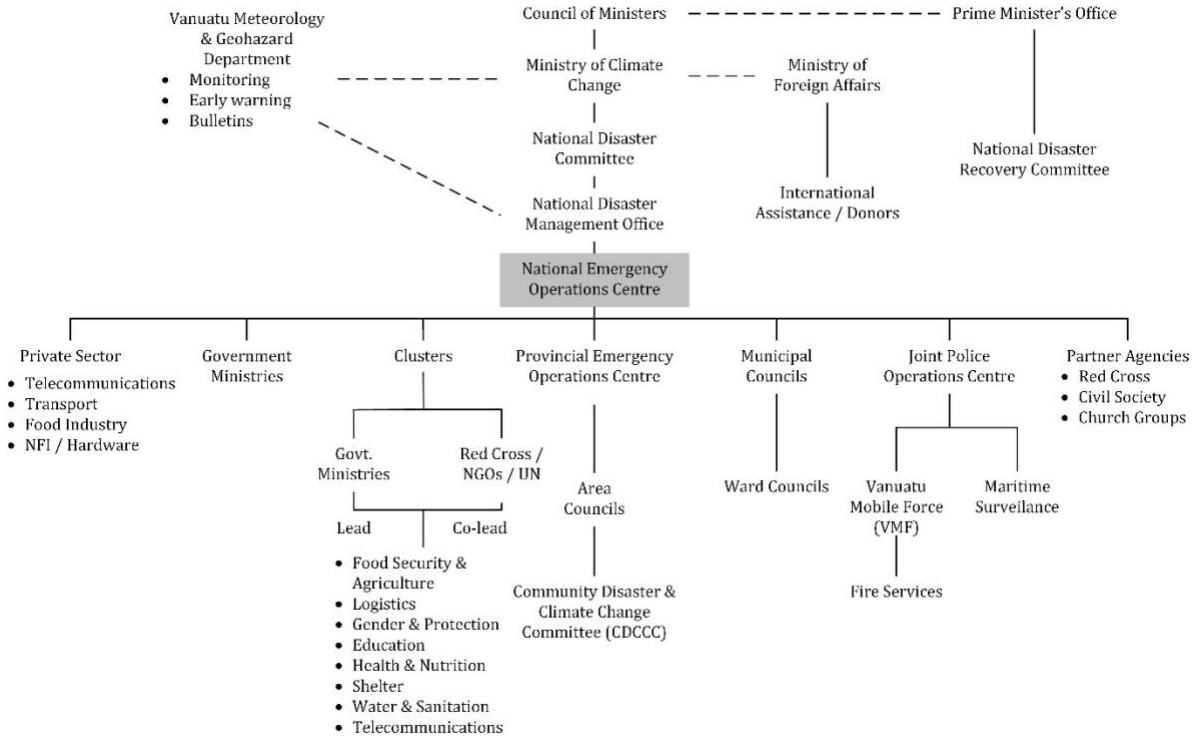

Figure 2: Vanuatu national coordination structure (adapted from NDMO website, 2018).

A key National Disaster Management Office (NDMO)[4] informant stated that before 2011 *"police had the roles of this department. And then only forecast planning and response. And only a small part on preparedness (interview 10)".* However, among other changes recommended in UNISDR frameworks and the academic literature (e.g., treating causal risk factors such as reducing exposure of new social infrastructure in development planning frameworks and recognising socioeconomic and gender related vulnerabilities in DRR and CCA strategies), Vanuatu has been implementing a decentralised Disaster Risk Management (DRM) system[5] (Figure 2). For

[4] The NDMO was described by one core staff member, employed since 2007, as: "NDMO its one department, but primary roles and responsibility of the NDMO is to coordinate and facilitate. Not really in implementing. So, the training we coordinate with all partners, in terms of training and then facilitate, the ideas and then disseminate the information, and to develop capacity of all institutions at national level and provincial level. But, down at the community, all partners only go down to the community and train them."

[5] DRM comprises both DRR and emergency management components.

example, national level institutions such as the Ministry of Climate Change, NDMO, and Vanuatu Meteorological and Geohazards Department (VMGD) (see Figure 2) have devolved some responsibility to such sectors and actors as: provincial level governments; INGOs including Red Cross, Oxfam, Save the Children, and UN agencies (primarily in "Clusters" such as food security and protection, water and sanitation (WASH)); the area level (i.e., island or group of islands), and local level through community disaster and climate change committees (CDCCCs) among other formal and informal institutions.

Two key national level institutions were established early in the devolution process: the Vanuatu Humanitarian Team (VHT)[6] in 2011 and the National Advisory Board on Climate Change and Disaster Risk Reduction (NAB)[7] shortly after in mid-2012. Comprising many INGOs and UN agencies, the VHT was initially concerned with response and relief, an urgent priority at the time, however, the affiliated agencies are now explicitly involved in DRR activities (interviews 11, 13). Conversely, the NAB, jointly directed by the VMGD and the NDMO, was created by combining separate climate change and disaster risk reduction institutional bodies whose aims and policy development were perceived as fundamentally the same: to reduce underlying risk (interviews 9, 10, 13). The NAB now operates as Vanuatu's principle policy, knowledge and coordination hub for all matters concerning climate change and DRR. In the words of a key national stakeholder:

> *…they tried to improve communication between government and NGOs, from NGOs down to communities. So, the NAB was sort of a platform for NGOs voices* [so they] *could be conveyed to the government and vice versa* (interview 13).

However, some NGO informants reported that the process for identifying proper national government channels was quite challenging. This may be due to the newly developed and implemented cluster system itself

[6] As described by humanitarianresponse.com: The VHT is convened by Oxfam; its members include the Vanuatu Red Cross, French Red Cross, Vanuatu Association of NGOs (VANGO), UNICEF, Oxfam, CARE International, Save the Children Australia (SCA), the Adventist Development and Relief Agency (ADRA), the World Health Organization (WHO), PeaceCorps, World Vision and Act for Peace, IOM and OCHA.

[7] The NAB states on its website that: "It is a committee made up of government and non-government members whose primary purpose is to act as Vanuatu's supreme policy making and advisory body for all disaster risk reduction and climate change programs, projects, initiatives and activities."

and/or poor communication between the government and INGOs. For example, this response from a new INGO manager in the WASH cluster (Figure 3) represents some of the perceived challenges we recorded:

> *Took me a long time to establish, well to figure out what those channels were, it took me a good 6 months. It would have been good to have some sort of networking, or just some sort of contact list even and some sort of general protocol with, for example, if you're going to be working in schools talk to this guy, like he works in the ministry of education, if you're going to do any water supplies in the community talk to this DIO* [designated institutional officer]*, or this department director, then the area secretary of that area council, the district area officer…* (interview 11).

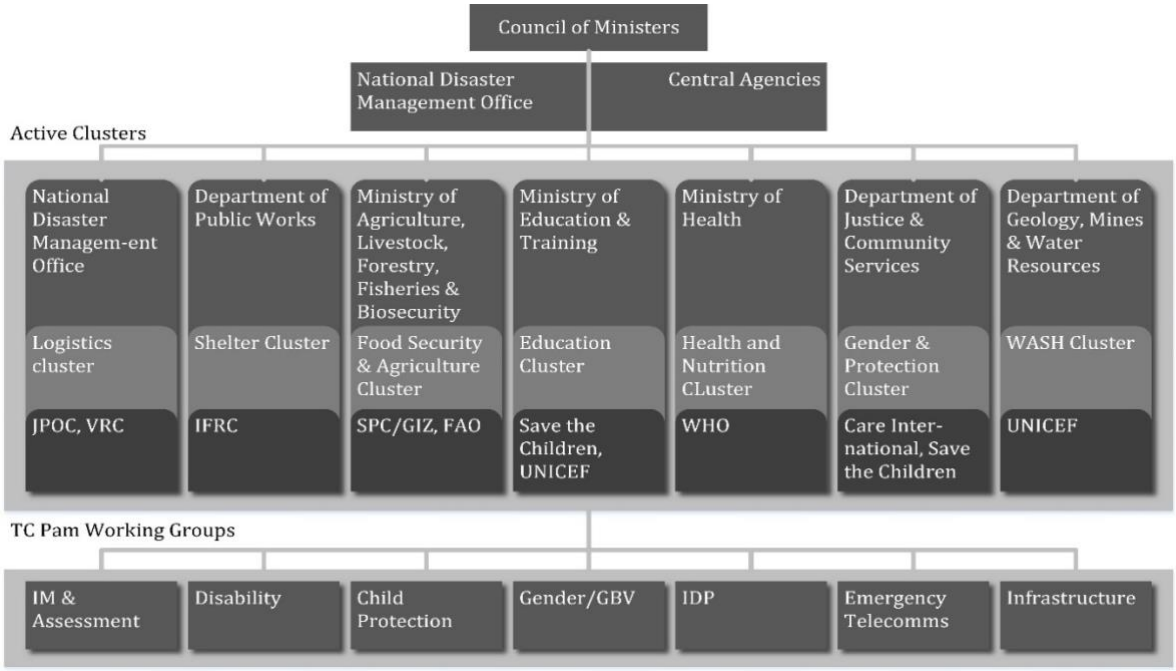

Figure 3: Operational cluster system (adapted from humanitarianresponse.com).

Although the cluster system (described well by Clarke and Campbell, 2018) is now established in Vanuatu it is still a work in progress and adapting. It is likely that the issues described above will be corrected in time through institutional learning of the new systems that have been put in place. Despite these issues, the development of novel decentralised DRR systems were perceived as positive by national and provincial informants as they are beginning to address many of the concerns of the national government such as reducing overlap, increasing communication between stakeholders, developing national capacity, and an ability to coordinate diverse actors to target national priorities (e.g., interviews 10, 11, 13). Further research on the conducive and hindering factors for the operation of the cluster system in Vanuatu would be beneficial.

3.2 Provincial level

The core provincial coordination structure is captured through the words of a Shefa Provincial (where Emae is located) officer:

> *You have the provincial council and area council. And then the area councils have the area secretaries, they're sort of the operational administrative arm of the area councils, they're mostly within the communities and sometimes they're in the CDCCCs (interview 12).*

Ideally information, knowledge and resources should flow from national DRR stakeholders (e.g., NDMO, Ministry of Climate Change) to the provincial council and down to the area council then area secretary and communities and vice versa. However, as will be discussed in section 5 and 7 below, there have been issues such as community level information not travelling upwards along the chain (interviews 6, 8). This was also identified on Tanna Island where aid agencies apparently disregarded valuable information presented to the NDMO from the CDCCCs about the impacts and urgent needs after Cyclone Pam in 2015 (Le Dé et al. 2018). Importantly, the provincial government headquarters become disaster operation centres immediately prior to, during and after a significant hazard is identified such as cyclone Pam. For example, they initially contact all provincial officers, get warning messages out over the radio and mobile phones, among other coordination responsibilities.

3.3 Local level: Emae Island

Local DRR actors for Emae include the area secretary, "*council of chiefs*" the "*chairman of disaster*" (interview 5), the CDCCCs, communities, families, individuals and the INGOs[8] (primarily Red Cross, Oxfam, and Save the Children) and UN agencies (e.g., WFP, UNDP) that operate throughout. The way information and knowledge flows

[8] Emae informants stated that "We have two NGOs, we have Save the Children, actually it's full up of NGOs coming in. We have Save the Children, we have Redcross, after we have Oxfam".

from national and provincial levels acts as an overview of this system, as the following passage from a CDCCC member in Tongamea village demonstrates:

> *Information comes in, when NDMO people, or Red Cross, or Save the Children, when they come, they go through the area secretary, they call them the area council. So, they go through the area council and then the area council contacts all the responsible persons, like chiefs, or health committees, or disaster committees and then we organise all the people together, then everyone come to the nakamal*[9] *[traditional chief meeting place] and then we talk to them...that's how information flows (interview 5).*

This passage touches on the importance of chiefs (and kinships systems) as DRR actors and the same informant goes on to say, *"But suppose you work without chief, no one will know. So, you must work with the chief."* In summary, while comprising newly established formal DRR and CCA structures Emae is steeped in customary governance structures which, if effectively utilised by national, provincial, and INGO stakeholders, shows significant promise for effective DRR and CCA.

4. Are stakeholders considering local and scientific knowledge in local DRR strategies?

> *"Vanuatu is one place where there's still some examples of how to put traditional knowledge into practice. This can help people understand how to be more resilient during a disaster (interview 9)."*

Although often framed as being in conflict, it is now recognised that both local ('inside') and scientific ('outside') knowledge should be considered when devising DRR strategies in the South Pacific (Gaillard 2007, Gaillard and Mercer 2012, Kelman et al. 2012, Mercer and Kelman 2009). On Emae Island and throughout Vanuatu, local knowledge is typically centred on a body of traditional knowledge and practise known as "*kastom*"[10] [custom] (Lindstrom 2008). Although not writing about kastom specifically, Berkes (2009) description of

[9] While traditionally the nakamal was designated as a men's only space, our community informants suggested that women also attended these discussions, but women reported they still have very little power in the decision-making process. As such, a serious concern relates to the utilisation of women's knowledge and their reduced status within Emae society and the implications for DRR (Jackson et al, 2017).

[10] Kastom is both a formalised system of governance based on such practices as customary land ownership, kinship rites, and exchange, and an empirical method for observing and understanding the world in which there is little separation between humans and environment.

traditional knowledge as content (i.e., information transferred between people) and as process (i.e., ways of observing and understanding the world) is pertinent. To help differentiate between traditional and scientific knowledge, the former is commonly considered to be local, holistic, and qualitative, while the latter is described as being global, reductionist, and quantitative (Gaillard and Mercer 2012).

Throughout Vanuatu's many distinct cultural groups, *kastom* has, particularly in the lead up to and after independence in 1980, become a catch all concept for various forms of localised and differentiated customary knowledge and practice. The unification of disparate cultures into a modern centralised nation state is always problematic and, as such, our data is only valid for Emae specifically. Additionally, while informants spoke primarily of '*traditional knowledge*" or "*kastom*' in the interviews and discussions, local knowledge can include a wide range of contemporary or traditional knowledge and practice. For example, due to the continuous influence of outside systems of thought, with Christianity, globalisation and neoliberal economics being the main drivers of this radical social change, distinguishing between traditional and non-traditional knowledge is challenging and the term local, or inside, knowledge is likely a more accurate conceptualisation. However, the informants appeared to prefer the term traditional knowledge therefore we have tried to represent their viewpoints as they were presented to the lead author during fieldwork, with the caveat that this may indeed be conceptually problematic. It is beyond the scope of this paper to truly iron this out although we will briefly return to this point in in section 7.

Local traditional knowledge is deeply embedded into the socioecological systems of Emae and developed over centuries of complex human-environmental interactions. This knowledge has been distilled into pertinent information about weather (e.g., weather patterns and hazards), agriculture (e.g., drought tolerant crops), and reef management (e.g., taboo no-take areas to allow recovery of stock), among other actions we now call DRR. Some of this information has persisted up to the present, yet, it was acknowledged by Emae inhabitants, among other stakeholders, as becoming less prevalent. For example, an Emae education stakeholder has observed that:

> *Traditional kustom practices they [Emae inhabitants] say 100% but I think 60%. It's not that weak, they're still maintaining but there have been some adjustments with traditional practices.*

Conversely, scientific knowledge is becoming further accepted and is tied-up with the concept of expertise, as NGOs and government stakeholders appear from afar bringing useful but external "outsider"

knowledge[11]. For example, the lead author brought an El Niño update sheet (one side English the other Bislama), taken from the Vanuatu NAB office to Emae, and the locals that could read digested it with zeal to garner any useful information regarding rain forecasts over February and March which was suggested to be below average. However, afterwards many Emae locals told the lead author that they foresaw limited rain anyway, seemingly derived from local knowledge (journal entry).

Promisingly, a high-level Vanuatu government stakeholder relayed that he, and others, encourage communities throughout Vanuatu to use multiple forms of knowledge to reduce risk and provided the following justification:

> *You take them and put them together. Suppose one fails, at least you can still prepare from the other one. It's like standing on your two feet (interview 9).*

This view was also held by several Emae community informants and the following response is characteristic:

> *Time when any something comes to form a natural[12] disaster, we must link traditional knowledge with western knowledge, to prevent issues we all face (interview 2).*

As such, Emae communities appeared to accept multiple forms of knowledge concurrently and were pragmatic about which may be beneficial to reduce risk.

For example, traditional ecological indicators used for hazard early-warning and short-and-long-term climate predictions are still considered important despite the increasing acceptance of scientific forecasts (e.g., cyclone warning, EL Niño updates) which are transmitted by mobile phones and Radio Vanuatu (interviews 1-5). Furthermore, communities emphasised having money, earned through the sale of fish and crops and remittances, to ensure access to long-life store-bought foods (e.g., large bags of rice, noodles) and traditional preserved food (e.g., sweet potato, cassava, banana) for use as emergency rations (interview 5 and informal discussions). Medicine is another good example, whereby Emae locals first try traditional medicine before turning to the clinic

[11] Nonetheless, this process also occurs when islanders leave to work in Port Vila or overseas and they return with new outsider knowledge, among other examples.

[12] The authors do not suggest that there are such things as natural disasters, however, one major vulnerability is that Emae locals believe disasters are inevitable and often refer to them as natural, or just as 'time of disaster," for instance.

led by a head nurse trained in western techniques (interview 1). Lastly, the benefits of western and traditional construction methods were being openly discussed in Emae, as only a few structures withstood cyclone Pam's ~300km/h winds. This interplay between traditional and modern construction methods is captured by this response from the Emae disaster chairperson:

> *Sometimes we stand in front of the committees and say, sometimes you need to go to all the concrete houses and build houses with concrete. Sometimes we must go back to making all local houses [fare tokas]. Local houses for us. Sometimes hurricane is strong, sometimes copper flies, all iron roofing, with the wind blowing, and we must run to the local grass house (interview 3).*

Traditional local houses are known in the local language of Fakemae as "fare tokas" or "hurricane houses" in English/Bislama. They are low, triangular prism shaped windowless buildings in which the roof is dug many metres deep into the ground made primarily from natangura (sago palm) leaves and wild cane (interviews 3, 5).

Regarding, scientific knowledge one of the most prevalent themes was a growing scientific understanding of climate change and potential consequences thereof. This response by a government stakeholder is pertinent:

> *What is climate change? Before, you say climate change and not one man would believe you. But all organisations come with small projects and educate them all together. Now they have good knowledge about issues related to climate change. But, people are beginning to lose their traditional ways of living (interview 9).*

The last sentence is representative of the wide-spread concern that scientific knowledge may be usurping local knowledge throughout Vanuatu. However, in this research it appears that scientific knowledge is perceived more as a tool on Emae, and different conceptions of nature and phenomena can be, and are, held simultaneously. For example, local knowledge on Emae had been enabling people to detect changes in the environment (e.g., sea level rise, changing precipitation patterns) for many years, and scientific knowledge

extended this understanding[13] (interviews 2, 3, 5). Thus, Emae locals hold multiple explanatory perspectives, scientific and traditional knowledge being just one example.

However, not all aspects of western ways of being are perceived as positive. For example, the Emae nurse explained that:

> *…people stopping living all traditional style living and have started adapting modern living, buying and eating food from the store, and they don't work very much, not going to the garden enough, sleep plenty, and NCD* [non-communicable diseases] *comes up* (interview 1).

As such, while utilising scientific and local (traditional) knowledge is critical for DRR, there is another discussion as to the benefits of western culture in relation to health and social cohesion, for example (Jackson et al. 2017). Moreover, many of the older generations of Emae were concerned that kastom was not being transferred to some younger people (journal entries).

In summary, are stakeholders at all levels considering local and scientific knowledge in DRR or related policy and practice? Our data suggests that while stakeholders at the national and provincial level acknowledged local knowledge as a valuable source of risk reduction, scientific knowledge was consistently prioritised in formal strategies. For example, hazard mapping, risk assessments, and early warning systems, the most frequently cited strategies, were approached using modern scientific methods, despite local knowledge of hazards being significant when questioned (Jackson et al. 2017). Moreover, the overall approach employed by DRR actors appears to be driven by a normative position that traditional communities would be less vulnerable if, for example, they further embraced western DRR governance and operational systems, and enacted behavioural changes (i.e., western education, neoliberal claims of entrepreneurship). However, by recognising the value of multiple ways of knowing, governments and practitioners can draw on different communities' strengths, such as traditional risk reduction, while imparting complementary scientific information where appropriate (e.g., potential climate change impacts on livelihoods, early warning, and healthcare advances). We believe that for DRR to be truly effective in places throughout Vanuatu which identify and utilise kastom and other variants of

[13] Another example of parallel understanding can be observed in regard to the significance of Christianity and the ideas presented in Genesis being "believed", however, traditional explanations of genesis and the importance of animism, for example, are still held as true.

local knowledge, the onus falls on international agencies and national governments to engage and develop tools and capacities that can capture this rich source of risk reduction and understanding of the local socioecological and sociocultural systems in which the people inhabit. Nevertheless, as further engagement with outside knowledge continues to change the composition of local knowledge, just what is traditional and is not, becomes harder to distinguish and this must be considered.

5. Identified DRR strategies: Multiple scales as well as top-down and bottom-up

As the previous two sections located key actors and considered local and scientific knowledge, this section will identify and evaluate existing DRR strategies, both formal and informal. This is done in relation to Gaillard and Mercer's (2012:95) suggested condition that, "actions at different scales, from the top-down and from the bottom-up, are necessary to reduce the risk of disaster in a sustainable manner".

In Vanuatu, top-down strategies, such as planning and development frameworks (Table 1), training and awareness raising, emergency plans, and response systems predominate. Despite this, we identified several bottom-up risk reduction strategies, such as community-led land and coastal management (e.g., no-take areas on the reefs, mangrove and coastal replanting, crop sharing between commercial farms and communities), various community-led committees (e.g., CDCCCs, education, women, health) and initiatives with avenues for feedback, among other examples in Table 2.

Nationally, the NDMO was in the process of developing plans for all hazards that communities in Vanuatu are exposed to. During fieldwork (early 2016) the only operational national plan was directed at cyclone risk, but there are locally specific plans and strategies that are in place (interview 10). The same is true for tsunami and earthquake exposure and risk, as there are isolated examples of hazard mapping, but with remaining unknowns throughout the archipelago (interview 10). However, it must be noted that during fieldwork old plans were being phased out including the "*Disaster risk reduction and disaster management national action plan 2006-2016*" and new plans such as the '*Vanuatu climate change and disaster risk reduction policy 2016-2030"* where in the process of being implemented which addresses these gaps. An NDMO informant indicated:

> *Along with the Geohazards [department], we've taken the lead with one project in DRR, working with them. So, we started off with tsunami, and after we generated one risk map of volcanos to see where the most at-risk areas*

are (interview 10).

National and provincial level informants often, and perhaps at times unintentionally, framed the hazard as the only causal agent of disaster instead of a combination of existing vulnerability and exposure to hazards. This conceptualisation of disasters has been demonstrated to lead to reactive strategies such as early warning systems and other post-disaster responses (Lavell and Maskrey 2014, Oliver-Smith 2013, Oliver-Smith et al. 2016). Treating causal risk factors demands, among other things, the institutionalisation of disaster risk by all government departments and functions (i.e., planning, education and health, environment, trade and investment), NGOs, and the communities themselves (Oliver-Smith et al. 2016). This was known by national and provincial informants as "mainstreaming": whereby risk factors associated with climate change and DRR are treated through the process of sustainable development (Nalau et al. 2016). This was widely discussed by informants and is present in Vanuatu's DRR frameworks and strategies. For example, "*The Pacific Risk Resilience Programme* (2014-18)" was explained by the Vanuatu country representative as:

…basically trying to integrate risk into cross sectoral development planning processes, or institutional mechanisms. And as well as the vertical governance tracks, more the sub-national. Ensuring risk is integrated into decision making and there's an element of community risk governance as well. So that involves developing plans for communities. And then there's a, sort of a diffusion of information, so communication component for that particular programme (interview 8).

As this passage suggests, elements of both top-down and bottom-up engagement are present although it is concerning that "developing plans for communities" was said instead of with, or in consultation with, communities.

Additionally, the PRRP was helping the Department of Local Authorities with risk integration within the development and planning process for the provinces, area councils and communities throughout Vanuatu. A key informant relayed that, *"we're at that very integral part where we're integrating risks into the development planning framework (interview 8)."* However, a key INGO informant thought that while there had indeed been progress with bringing CCA and DRR together, development is driven more, "by [the] economic development agenda, environmental, social and separate cultural, without necessarily thinking holistically about climate change and disaster risk (interview 11)". This is response, from a well informed and nationally engaged INGO informant is significant considering the large amount of material published and newly founded institutions that purport to factor CCA and DRR in all development processes throughout Vanuatu.

Table 2: A selection of strategies identified at national, provincial, and local scales.

	National	
Top-down	**Both**	**Bottom-up**
Risk and hazards mapping-NDMO (interviews 10, 11) [technical capacity].	Decentralisation of responsibilities to the provincial, area, and community level (interviews and secondary sources).	Emae communities and national and provincial stakeholders accept the importance of traditional (local) knowledge and scientific knowledge when devising local DRR strategies.
Treating risks in the development process through planning frameworks (interview 8).	Water infrastructure such as gravity wells and tanks in villages and other structural methods, but with training provided to help community up-keep (interview 7).	Engagement with youth, women, disability groups and their experiences feeding into policy (interview 6).
Disaster response & relief systems e.g., scientific forecast, dissemination (e.g., mobile phones, radio), concerted relief efforts with regional partners (e.g., food aid) (interviews).	Government policy forums in villages with avenues for feedback and engagement (participant observation) (interview 7 and participant observation).	Working with communities to enact planned retreat. Example from Banks Islands and Tanna Island given (interviews 9, 10).
	Provincial	
Top-down	**Both**	**Bottom-up**

Emergency operation centres and preparation and response plans (interview 8).	Training of provincial level representatives in their responsibilities and identifying issues at the province level (interview 8).	During disasters such as cyclone Pam, encouraging the first reports and assessments to come from the area secretary and CDCCCs (problematic in action) (interviews 4, 5).
Waiving school fees for several terms after cyclone Pam to help communities recover economically (interviews 1-3).	Development e.g., market houses in villages and working with communities to produce value added products and access potential markets (interview 8).	Trying to impart knowledge, information and resources to allow provincial level stakeholders to be able to operate effectively and take ownership of DRR.
	Local (Emae)	
Top-down	**Both**	**Bottom-up**
National, provincial, area, and local disaster response plans (interview 10).	Health programmes developed in tandem with communities (e.g., sanitation and hygiene) (interview 1).	Proposed coastal retreat (limited by land disputes however) (interview 5).
Awareness raising, policy forums (e.g., mining, fisheries), and projects such as water systems and health strategies (e.g., malaria eradication) (participant observation).	Discussions with Emae communities about formalising "kastom" no-take areas, however people concerned about government control (journal entry).	"Tabu" kastom no-take management zones on the reef; coastal replanting; crop sharing (interviews 3-5); inter-intra-community collective action (e.g., clearing roads).
Hazard assessments on Emae by NDMO stakeholders among other transect walks (interview 5).	NDMO trainings and assessments with CDCCCs and the area secretary and information	Traditional knowledge such as building design and constructions, cutting crops before cyclones, ecological

	traveling from the local to national (interviews 4, 5).	indicators for hazard early-warning or planting cycles (interviews 4, 5).

Regarding bottom-up approaches, they were typically perceived as being a necessary component of any successful strategy. For example, an NGO informant gave this response to a question about the benefit of bottom-up approaches:

> *we're finding that we're getting a lot more positive response by doing this bottom-up approach where the community establishes what their plan is and then they commit to that, they've signed off on their action plan, so it's them making that decision it's not us. That's made a big difference (interview 12).*

Another example of community-led development is provided by a government stakeholder, whereby:

> *…whenever we want to help the communities say, hey if you want, if this is your priority for the community, let's say a market house. If this is the priority of this village because it will assist you in subsistence farming and having a market to sell your produce and then generating income to save for a rainy day to use when it comes to a disaster time. And to use, to pay for school fees and for essential things, basic needs that your family needs. For this market place to be erected what are the risks that you'll come across if we build this…. (interview 8).*

As such, it appeared that most national and provincial stakeholders understood the criticality of bottom-up approaches, however, the view is slightly different from the view on-the-ground on Emae.

For context, Emae inhabitants championed the "ideal" of being independent from Port Vila, for example, a high-status villager leaned over during a discussion about independence (1980), which they are undoubtedly proud of, and said "*we're independent, they're not*" (journal entry) pointing towards Efate island (where the capital Port Vila is located) which is ~40km to the south. However, many informants also bemoaned the lack of support given by the government although, possibly due to more frequent contact and perceived help, INGOs were discussed in a more favourable light.

Regarding DRR, the concept is not clearly established (i.e., it was considered closer to "preventing disaster") but traditional risk reduction is part of daily life and thus DRR is arguably well established (Table 2). With external interventions, which were perceived as occurring more frequently (interviews 1-5), communities were happy to be

aided but often had very little say in what was going to be implemented. However, an international aid agency funded project to replant mangroves on the north of the Island and INGO and government help in the form of water systems (e.g., gravity wells and rain-water tanks) were two examples of favourable interventions, due to alignment with priorities: food and water. Emae informants relayed that when stakeholders go through the proper channels of the area secretary and the chiefs, then interventions are perceived more favourably and are likely to persist.

As such, when a strategy is being devised, it remains important to determine if it aligns with local priorities and ways of knowing, understanding, and ownership, and if it does, then positive engagement is likely to follow. For example, a leader of an Emae environmental NGO replied to a question on what an example of a successful government long-term risk reduction strategy was:

> *…the big guy's in fisheries come and talk with the community, chief, and the people of the community. And then explain why we need to have conservation. Population is growing, climate change is contributing too, high demand from man eating fish, this is putting a lot of pressure, but this time we must prepare for the next 5 to 10 years' time and 20 years' time to try and make conservation, long-term plan. So, all the people are happy, agree to make small conservation (interview 3).*

Everyone on Emae was aware of the need to protect, preserve, and improve the reef due to its vital role in providing food security after disasters and during "normal times". This may serve as a requirement for successful DRR.

Despite stakeholders from national levels recognising the need for bottom-up approaches, there is still a notion that international and national institutions know best. However, as with section 4 on knowledge, there needs to be further engagement with the dominant, fundamentally non-western, systems of governance on Emae to ensure communities feel involved and empowered by DRR strategies. This may fuel a greater sense of ownership of their risks and potential treatments. Conversely, if the government and external (e.g., aid agencies) stakeholders recognise the importance of bottom-up strategies and capacity building they must also accommodate and value the information that comes from the communities even if it does not always align perfectly with western conceptions of DRR. The underutilisation of disaster information emanating from local communities on Tanna Island after cyclone Pam in 2015 by external aid agencies is another empirical example of this although specifically related to response (Le Dé et al. 2018).

6. Conducive and hindering factors in developing local DRR strategies in Vanuatu

Derived from the discussion above along with some further data, this section will return to our stated research question: What are the conducive and hindering factors in developing local disaster risk reduction strategies and their effectiveness? From the data we identified several hindering factors for developing local DRR strategies in rural Vanuatu of which those relating to stakeholders, knowledge and strategies are presented in Table 3.

Table 3: Conducive and hindering factors, adapted from Gaillard and Mercer (2012).

	Conducive factors identified	**Hindering factors identified**
Stakeholders	A wide range of stakeholders from international to local scales working together through a decentralised DRM system.	While on paper (Figures 1-3) operational and functioning, new INGO stakeholders often found the operational governance system opaque and proper channels elusive.
Knowledge	Acceptance by stakeholders of the importance of local and scientific knowledge.	In practice this acceptance seems to diminish, and scientific knowledge is preferred in formal strategies.
Strategies	Many top-down and bottom-up strategies identified.	Top-down more prevalent. Need more connection and continuity between different stakeholders and strategies from all levels.

Additionally, we identified other perceived limiting factors including: 1) physical and human geography; 2) limited capacity; 3) poor understanding of causal factors of risk; 4) community disputes; and, 5) perceived growing aid dependency. We will briefly introduce these limiting factors with a quote given as an example.

First, the geography of Vanuatu (e.g., diverse cultures and languages [100+], small dispersed populations) when coupled with expensive and limited transport (e.g., chartered flights and ships/boats) makes stakeholders from the national and provincial level less able, and/or willing, to visit communities. For instance, a government stakeholder relays:

Going to Torba [northernmost province]. I'm there to run a training with the newly inducted councillors for the provincial council. I'm there to run the local elected leaders training. Together the cost of getting there is like from here to Australia and back and one more trip back to Australia (interview 8).

The lead author can vouch for the exorbitant cost of transport even on relatively short flights. Although in-person engagement remains important, many remote islands now have access to mobile phones and communication systems therefore relationships and knowledge sharing can still occur from a distance. This, however, does not mean face-to-face contact should be completely bypassed, as this is how knowledge and information are primarily exchanged.

Second, there was a purported limited capacity to formally implement the advocated decentralised system at all levels. For example, a provincial level stakeholder suggested that the:

…big problem one, at the level of area council, we want a more bottom-up approach, bottom-up approach when we work with them. The community doesn't yet understand how to make a project proposal all together to come through the area council. And the area council, sometimes, they only sit down and forget, they think oh just because we've had a meeting that's enough, this is one weakness in this place here. Especially with information, passing of information and transferring information (interview 12).

This response suggests that the limited capacity lies primarily at the local and area level however this may be misleading as international, national and provincial stakeholders are projecting western bureaucratic implementation requirements onto a local sociocultural system with little experience with this, and where knowledge is created and transferred in fundamentally different ways. For instance, literacy and numeracy levels are at very low levels throughout Emae, and rural Vanuatu as a whole, even among those in contemporary positions such as the area councils and CDCCCs, therefore devising a proposal document may be an unrealistic expectation in the early stages of decentralisation. Community informants demonstrated they were well informed about their risks, needs, abilities and limitations, and generally talk communally in an informal exchange of ideas or "storian." Thus, stakeholders need to recognise that different forms of knowledge generation and transmission operate in rural Islands throughout Vanuatu and develop tools and abilities to capture this detailed local understanding and utilise it in formal DRR strategies at all levels.

Third, a poor understanding of causal vulnerability and subsequently DRR itself at all levels. This issue was raised several times by national stakeholders, for example,

…people only know, or really understand emergency. DRR, disaster risk reduction, it's all messages and ways to reduce risk. But at the same time the development inside the community, slowly people come to understand them and then accept the changes that are happening or might happen (interview 10).

When asked about DRR strategies at the community level, often people conflated "time of disaster" and all disaster activity to preparation and response. However, Emae communities were actively undertaking DRR activities without labelling them as such (e.g., see section 5). Nonetheless, many national, provincial, and local stakeholders held the belief that disasters were inevitable which may be leading to some complacency regarding proactive DRR at all levels. Throughout Vanuatu the dominance of localised variants of kastom, and especially syncretised forms of Christianity, should be acknowledged as they both in different ways consider phenomena, including hazards, as being a part of life. Particularly with the prevalence of evangelical Christianity, calamities often become expressions of "God's will." This was also the case with climate change, which, albeit an extreme example, was explained once as God's punishment due to a decline in morality (journal entries). As such, this issue is rooted in the sociocultural systems rather than just a misunderstanding of DRR, which itself is a foreign and conceptually difficult concept for rural people to understand.

Fourth, a major limiting factor for local DRR often mentioned in the academic literature yet regularly skimmed over in national strategies, relates to land disputes (sometimes just called community disputes). We raised this point in our previous study (Jackson et al. 2017) and suggested that it drives vulnerability by making, for example, coastal retreat or complete relocation very difficult as this leads to conflict over boundaries. Moreover, water infrastructure in the form of gravity wells and water distributing systems provided by INGOs after cyclone Pam had not been implemented in all villages and this had led to some jealousy. An Emae education informant captures this issue stating: "*we face a lot of difficulties, with communities sharing same boundary (interview 4)".* Once again, greater engagement with communities to identify their institutional and political vulnerabilities may reduce unintended consequences such as increased conflict from DRR and CCA interventions.

Lastly, during discussion on Emae and with stakeholders in Port Vila, there was a perception that while humanitarian aid may be necessary, it nevertheless impacts the way communities prepare and respond to hazards over-time.

But you can definitely see the effects in some communities, even in the short time I've been here, from the inception straight after the cyclone, people weren't used to receiving help and then suddenly there's just a

massive influx of dollars and organisations and people running around trying to be helpful and then, yeah, over the last year almost since Pam came through it's like you can see that transition where people are just expecting groups to come through and help them. Like El Niño comes, so like we don't have water, alright, why don't you do what you did when you had Pam, we need all this stuff now (interview 12).

This belief was held by other stakeholders and community informants on Emae, particularly elders, whereby they suggested that outside help was a kind of double-edged sword: helpful in the short-term, but maybe leading to complacency and not taking proactive approaches to reduce risk by undermining traditional adaptive actions (Jackson et al. 2017).

7. Practical ways for creating conducive conditions to reduce risk

This study has considered what are the conducive and hindering factors for local DRR strategies and their effectiveness in Vanuatu, drawing on a case study of Emae Island. We found a nascent, DRR operational governance structure comprising many government and non-governmental actors working together to implement both top-down and bottom-up DRR strategies, with stakeholders outwardly considering both local and scientific knowledge. However, despite this architecture being tentatively in-place, many issues were identified when critically assessing DRR strategies implemented at the local level on Emae Island.

Our data suggests formal DRR strategies were more generic (e.g., capacity building) and related to improving institutional structures (e.g., area councils, secretaries and CDCCCs), which both tend to focus more on immediate preparation and response. However, actions targeting causal vulnerability such as land and coastal management, education and healthcare initiatives, and diversifying livelihood strategies (e.g., "small market"), which were indeed identified albeit to a lesser extent, are central to long-term sustainability and resilience against physical hazards and all threats including those posed from economic, social or political processes (Oliver-Smith et al., 2016). Because DRR was often perceived as primarily ex-post policy and management, this has led to a predominance of conceptualisations of disasters as inevitable which occludes the actual underlying vulnerability driven by social processes which needs to be addressed. Nevertheless, response systems, as introduced in section 3, were a priority in 2011 when the police had the role of disaster management and formal DRR was almost non-existent, and improvements seem to have been made (e.g., forecasting, text messages and radio warning of hazards), but this remains just one dimension. DRR and CCA strategies ultimately need to be reframed as actions that target causal vulnerability which includes ecological, social, economic, cultural, and historical processes and

factors (see Jackson et al. 2017). For example, exposure to hazards and climate change impacts, poverty, maladaptive development, and the loss of traditional livelihoods and capacities due to the influence of the colonial period, Christianity, and more recently, neoliberal economics, among many factors all influence people's causal vulnerability to climate change and disasters (e.g., Kelman et al. 2015, Oliver-Smith et al. 2016). To limit attention to just hazards runs the risk of the re-creation of disaster vulnerability which led to the deleterious impact of such hazards as cyclone Pam and the 2015/16 El Niño drought ad infinitum. With climate change likely to impact the intensity, and in some cases the frequency, of hazards such as cyclones, droughts and flooding, this becomes even more urgent.

Nonetheless, DRR and CCA are both western concepts seeped in scientific "outside" knowledge systems that is being driven by international and regional partners inside Vanuatu, a nation of diverse cultures with a rich and sustained history of disparate traditions and practices referred to collectively as kastom. Reducing disaster risk has been (e.g., historical livelihood strategies and adaptations) and remains a priority (e.g., national and international engagement in DRR policy). It is now accepted that both scientific and local knowledge should be utilised for effective DRR (Gaillard and Mercer 2012), yet, our data suggests there has been too great a focused on outside, western knowledge. Despite conflicts between the localised variants of kastom, in which nature and people are not clearly separated and beliefs such as animism and a connection to place are paramount, and western detached and, ostensibly, objective science being inevitable, there are potentially fruitful avenues open to reduce this. For example, further engagement with informal and formal institutions such as kinship networks and traditional governance systems (e.g., chiefs, religious leaders) and local knowledge (e.g., land and coastal management, building and construction techniques, and early warning through ecological indicators) and information sharing norms (e.g., informal group exchanges) shows the most promise for creating the conditions for successful formal bottom-up strategies, which appear to have many more barriers than top-down strategies in Vanuatu. Yet, kastom, holistically, as a national characteristic of Vanuatu and its localised expressions, which still prevails in Vanuatu, may not be characteristic of other Pacific Island countries, nor all Vanuatu contexts, and this should be acknowledged. Despite this, all places have, to varying degrees, local knowledge and capacities that need to be engaged with. For instance, many stories of resilience we identified during fieldwork on Emae related to intra-and inter-community collective action to address a specific problem that had been identified and agreed on as a priority (Jackson et al. 2017), which has been shown previously in other studies throughout the South Pacific (Campbell 2006, Gaillard 2007).

Despite the many geographic, economic, and political challenges Vanuatu faces in implementing an effective DRR structure, progress has no doubt been made towards the Sendai framework. Many of the issues we have discussed throughout this study are not insurmountable, but they do require significant institutional shifts at the international, regional, national, provincial and local levels. Although DRR is primarily a responsibility of national governments, regional partners and INGOs are now heavily involved in helping develop Vanuatu's national DRR system. This is positive and the development of and greater engagement between INGOs and the government through the cluster system that has been introduced is a step in the right direction. Nevertheless, building up Vanuatu's own capacities to confront future hazards must be the primary long-term goal. Conversely, at the national and provincial levels the goal, as laid out through their decentralisation plans, must be the increased capacity of communities to confront and manage their increasing disaster risk. Bottom-up must be more that than a buzzword in policy, it must mean deep listening, supporting, and utilising the significant risk reduction knowledge and practice that exists at the local level. This is equally relevant to CCA as well.

The take home message from this study is this: to reduce hindering factors when implementing vulnerability reduction strategies to hazards, including climate change, further development of Vanuatu's national and provincial coordination structure is needed along with the development of tools and management capacities that engage with the local formal and informal institutions at the island and community level. Despite the technical, political, and practical challenges, as outlined throughout this paper, this should be the priority. Creativity and novel actions are needed, along with tried and true methods, using a form of institutional adaptive learning where successes and failures can inform future policies throughout Vanuatu, the Pacific, and the world.

8. Conclusion

This paper has presented stakeholders' perceptions on some of the key conducive and hindering factors for developing local DRR strategies in rural Vanuatu. Despite significant issues identified, such as international and national stakeholders preferring scientific knowledge and the underutilisation of bottom-up information and knowledge, stakeholders were nevertheless aware of the importance of local and scientific knowledge, top-down and bottom-strategies, and the need for stakeholders from all levels to work together to improve DRR in a sustainable manner. The capacity of local stakeholders, while perceived as limited, must be encouraged through

concrete policy and actions, while top-down strategies from all levels should continue to focus on the underlying causes of vulnerability that continue to drive disaster risk. We hope this paper has provided researchers and practitioners working throughout Vanuatu, and potentially beyond, some practical advice for devising Sendai compliant DRR systems in a world of increasing disaster risk.

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