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“God and Tonga are my inheritance!” – Climate change impact on perceived spirituality, adaptation and lessons learnt from Kanokupolu, ‘Ahou, Tukutonga, Popua and Manuka in Tongatapu, Tonga

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Abstract

Climate change is a significant threat to health and well-being, in particular to people’s spiritual well-being, in coastal areas and communities. This paper describes the findings of a 2013 study on impacts of climate change on people’s spiritual well-being in 5 coastal communities in Tongatapu, Tonga: Kanokupolu, ‘Ahou, Tukutonga, Popua and Manuka, using a concurrent convergence parallel triangulation design. Information was collected from a group of 460 participants aged 15-75 via self-administered questionnaire, in-depth interview (IDI), focus group discussions (FGD) and key information interviews (KII). There was a statistically significant difference between people whose spirituality was affected and those unaffected ($p<.005$). People who were worried and whose physical well-being were affected, emerged as the most strongly affected ($\chi^2(4)=15.780, p<.005$). The same factor was explored qualitatively using thematic analytical strategy, and concluded that climate change had affected people’s spiritual well-being, negatively. Lessons learnt from this paper will be useful for people invested in policy practice, and pastorate serving the cause of holistic Climate Change Adaptation (CCA) in Tonga: preaching, fasting and praying to God to reverse climate change and its impacts, help State and Church to adapt more effectively and comprehensively.

Introduction

Consequences of global climate change impacts are already observed in coastal communities (Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2014; IPCC, 2014a, b, c; Michaelis, 2011) and have also significant impact on people’s spirituality (Ministry of Environment and Climate Change & National Emergency Management Office, 2010; Nunn et al., 2016). Evidence suggests that research on

perceived impact of climate change on spiritual well-being, however, is still very limited (Barnes, MacGregor, & Alberts, 2012; Havea et al., 2017; McIver et al., 2014; Woodward, Hales, & Weinstein, 1998; World Health Organisation (WHO), 2011). To fill in this gap in knowledge in Tonga and the Pacific, a research was conducted in 2013 to better understand how climate change has affected people's well-being using a mixed method approach (Havea, Hemstock, & Jacot de Combes, 2016; Havea et al., 2017). This paper focuses on assessing the impacts of climate change on people's perceived spiritual well-being and the spiritual adaptation strategies needed for the five coastal communities in Tongatapu, Tonga: Kanokupolu, 'Ahou, Tukumonga, Popua and Manuka.

As Tonga is a Christian nation and with one of the highest rate of Christianity in the world (99.5%) (Statistic Department of Tonga, 2016), when climate change affected people's physical environment and their church activities, it affects them spiritually, since they blame everything on their God. This system of belief is particularly significant for people's well-being in Tonga because the two major factors perceived to be important in terms of national well-being, are religion and education (Havea et al., 2016; Matangi Tonga Online, 2001), which was mandated by King George Tupou I, who had dedicated Tonga to God in 1839 (Sekona, 2014), through his motto, that "God and Tonga are my inheritance" (Lātūkefu, 1975, 2014). So, when climate change affected church and/or their physical environment, (Government of Tonga, 2015), it affected them spiritually (Bible Society of the South Pacific, 1966), as opposed to Australia, USA or UK (Government of Tonga, 2016; Leiserowitz et al., 2015; Morrison, Duncan, & Parton, 2015).

As this legacy is significant to Climate Change Adaptation (CCA) and Disaster Risk Management (DRM) (Government of Tonga, 2015) in Tonga, by improving people's spiritual well-being through climate change adaptation in such a religious nation is therefore needed. God and Tonga are my inheritance (Koe 'Otua mo Tonga ko hoku Tofi'a), is the most significant element in people's spiritual well-being because of church, and linking it to climate change adaptation and disaster management is vital. This helps to refine and perfect the course of adaptation better, identify what forms of spiritual resilient healing and prayer is needed, and how these sustainable measures can be used to protect people's spirituality and inheritance. Most importantly, this may help fostering their fellowship with God for protection and peace, thus contributing to make Tonga a more resilient and a sustainable nation, by 2035 and beyond (Government of Tonga, 2016).

Methods

Methodology

Participants were Tongans aged 15 to 75 from Kanokupolu, 'Ahau, Tukumonga, Popua and Manuka in Tongatapu, Tonga. The study assessed the perceived impacts of climate change on spirituality amongst 460 participants, who were selected to complete a self-administered questionnaire. Then, 24 participants were randomly chosen for in-depth interview (IDI) for more than 30 minutes, and 28 participants were randomly selected for focus group discussion (FGD) in the form of workshop for one day in Vakaloa beach resort in Kanokupolu, Tongatapu. In parallel with this collect of information, 12 key informant interviews (KII) were also conducted with people more than 75 years old in these five coastal communities, senior government officials in the Government of Tonga (GOT) and a representative from a church organisation in Tonga (Havea et al., 2017).

The mixed method approach used 'concurrent convergence parallel triangulation design' because the data was collected at the same time – concurrently – and then merged – combined or blended. Parallel corresponds to the fact that it was equally weighted (no emphasis) during the analysis, and triangulation – since the implementation of the data collections technique has used more than one method (Creswell, 2013, 2014; Creswell & Plano Clark, 2007, 2011). The study was conducted purely in Tongan to facilitate discussions and the data collection process in the communities and has been assisted by a local research assistant.

Data analysis strategy

Data was concurrently analysed using convergence analytical approach – that is a hallmark of mixed method research (Creswell, 2013, 2014; Creswell & Plano Clark, 2007, 2011). In the first phase, the authors determined those whose perceived spiritual well-being was affected and those who were unaffected, using binomial and chi-square goodness-of-fit tests for comparisons of proportions, respectively, and correlation analyses computed with Kendall's tau-b (T_b) (Peck & Devore, 2012; Springer, 2012; Sullivan, 2013). Then, a binary logistic regression (Peck & Devore, 2012; Springer, 2012; Sullivan, 2013) was used to describe the relationship between the 4 predictors (gender, worry, mental well-being (relating to the happiness of the mind), and physical well-being (relating to impact on physical environment) and the perceived spiritual well-being impacts. Altogether, there were 109 questions on well-being (including livelihoods and health) with nominal and Likert scale using 5-point scale type of response from strongly disagree to strongly agree. Data analysis was carried out with the use

of SPSS 23 (IBM Corporation, New York, USA), Minitab 17 (Minitab Inc., Pennsylvania, USA), and JMP 11 (SAS, North Carolina, USA).

In the second phase of data analysis, a thematic analysis (Bazeley, 2007; Miles, Huberman, & Saldaña, 2014; Ozkan, 2004) was used to derive a theme related to the impact of climate change on perceived spirituality using QSR N10 (QSR International, Melbourne, Australia). Information was collected using semi-structured face-to-face interviews with the participants. All interviews were audio- and video-recorded and then translated and transcribed into the computer for analysis. The focus was on responses to interviews and focus group questions that related to the discussion of the perceived impact of climate change on spirituality. These themes were then related to the quantitative analysis.

Study limitations

Although the research has reached its aim, there were some limitations. First, the research would have gained more weight if the president from churches in Tonga had been involved, because people in these communities were very religious. The reason is that church leaders are more powerful and trusted in delivering messages on climate change impacts and adaptation strategies to people in these coastal communities than scientists and local government (Nunn et al., 2014; Nunn et al., 2016). Second, the limited funding for this study does not enable the researcher to go back to the communities in Tonga to present the findings and collect feedbacks from the participants. Thirdly, because the study was specifically designed for Tonga as a Christian state, it may not be applicable to secular countries. Finally, the research did not assess the impact of improving spirituality on health or how to use it to eliminate the impact of diseases that are climate change-related on people's health.

Results

Quantitative Analysis and Results

Gender

Of the 460 participants recruited to participate in the study, there were 244 (53%) female and 216 (47%) male. This percentage is very close to the general population in Tonga (male=49.4%, female=50.6%) (Statistic Department of Tonga, 2016; Tonga Department of Statistic, 2011, 2013b). Meaning that the view of people whose perceived spirituality was affected by climate change in this study, the adaptation and disaster management strategies proposed by them can be used to represent all women and men in Tonga.

Number of participants in the 5 studied coastal communities

The study recruited 40 participants from Kanokupolu, 52 from 'Ahau, 77 from Tukumonga, 246 from Popua and 45 from Manuka (Figure 1). This distribution however is almost the same as the distribution of the general population in these five coastal areas and communities (Statistic Department of Tonga, 2016; Tonga Department of Statistic, 2011, 2013b).

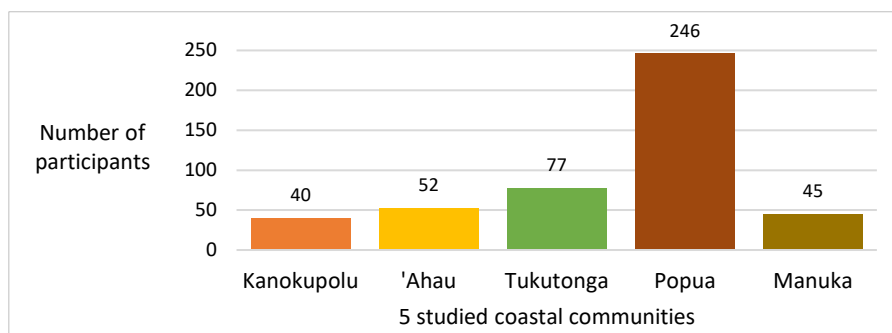


Figure 1: Total number of participants in the 5 studied coastal communities

Religious denomination – Christian (Including the Bahai Faith)

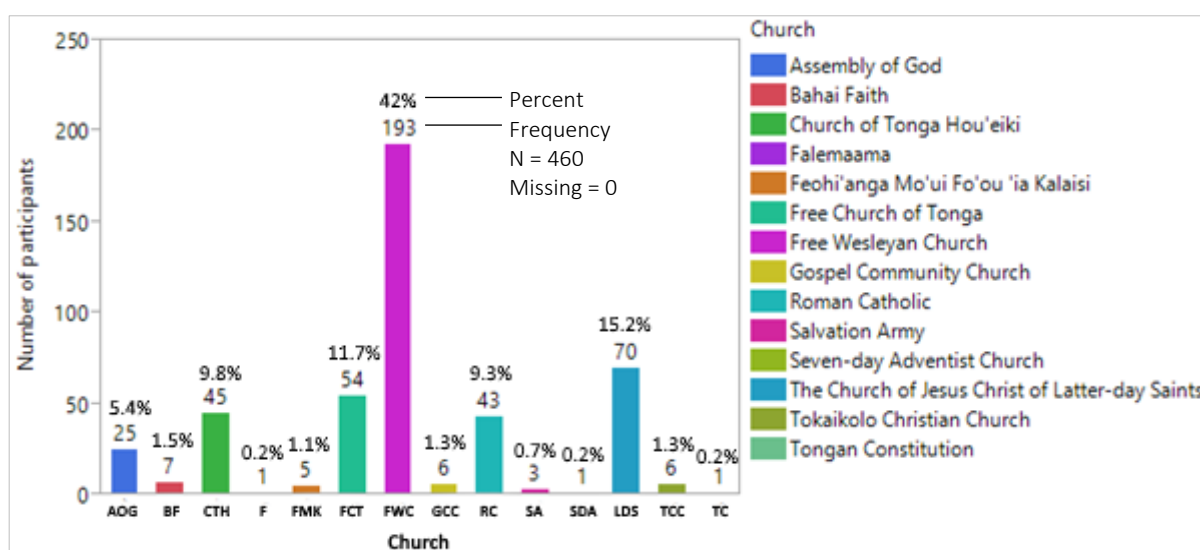


Figure 2: Number of reported Christian religions adherents

This study found participants belonged to 14 Christian churches, dominated by the Free Wesleyan Church (42%), (Figure 2). Although the study indicated that Tonga is a Christian state, non-Christian religions are practiced as well. This is important because although the sample were 100% Christian, the general population is not (Statistic Department of Tonga, 2016; Tonga Department of Statistic, 2008, 2011, 2013a, b, 2016; Tonga Department of Statistic & Secretariat of the Pacific Community (SPC), 2008).

Comparing people whose spiritual well-being was affected with non-affected to inform adaptation strategies in coastal communities

Out of the 460 participants in the study, 98% (451) indicated that climate change had affected their spiritual well-being, while only just 2% (9) indicated that their perceived spiritual well-being was not affected.

Further to the frequency analysis, the collected response data were also analysed using binomial tests (Table 1), (Peck & Devore, 2012; Springer, 2012; Sullivan, 2013) and a sample goodness-of-fit test (Table 2), (Peck & Devore, 2012; Springer, 2012; Sullivan, 2013).

Table 1: Perceived impact on spirituality

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Spiritual well-being affected	Group 1	Yes	451	.98	.50	.000
	Group 2	No	9	.02		
	Total			460	1.00	

Table 2: Chi-square goodness-of-fit – perceived spiritual impact

		Spiritual Impact	
Chi-square		424.704 ^a	
df		1	
Asymp. Sig.		.000	
	Expected N	Observed N	Residual
No	9	230.0	-221.0
Yes	451	230.0	221.0
Total	460		

a. 0 cells (0.0%) have expected frequencies less than 5.
The minimum expected cell frequency is 230.0.

Based on this sample, the study found that the mean proportion of Tongans aged 15 to 75 in Kanokupolu, ‘Ahau, Tukutonga, Popua and Manuka, whose perceived spiritual well-being were affected by climate change and those who were not, were statistically significant different, $\chi^2(1, N=460) = 424.704, p < .005$ (Tables 1-2). People whose spiritual well-being were affected value church significantly, are very worried about climate change and have their physical well-being affected much more than those unaffected.

Using the predictors of people whose spiritual well-being was negatively affected by climate change impacts to guide CCA strategy needed for these coastal areas and communities

Then, a binomial logistic regression (Peck & Devore, 2012; Springer, 2012; Sullivan, 2013) was performed using 4 parameters (gender, worried, mental impact and physical impact) to describe the relationship between them and spiritual well-being affected and to find out if it is

possible to predict who will have their spiritual well-being affected be based on their gender, how worried they were, how their mental well-being were affected and/or how their physical well-being were affected. The first part of the analysis was the Omnibus Tests of Model Coefficients (George & Mallery, 2016), which shows that this model was statistically significant, $\chi^2(4) = 15.780, p < .005$. The second part of the analysis presented the Model Summary (George & Mallery, 2016) using the Cox and Snell R Square and Nagelkerke R Square values and it shows that 19.2% (Nagelkerke R²) of variability in spiritual well-being negatively affected by climate change can be explained by the differences in people’s gender, how worried they were, and whether physical or mental well-being were affected or not.

As these results show that 80.2% of the variability cannot be explained by these 4 parameters, other factors can be used to rule out spiritual well-being impact as well. These factors could be how emotional and how religious the participants were, have had a death experienced from an impact of natural disasters (e.g. earthquake or tsunamis) on a family member before, water supply deficits, health affected (e.g. asthma, shortness of breath, pneumonia, influenza), and participants denominations’. Although these factors are very important to predict spiritual well-being affected, but they may or may not be a significant predictor and therefore they might or might not added a significant contribution to predict people whose spirituality will be affected as people who were worried and have physical impact did (Table 3).

Table 3: Binary regression analysis summary for negative impact of climate change on perceived spirituality

		Omnibus Tests of Model Coefficients		
		Chi-square	df	Sig.
Step 1	Step	15.780	4	.003
	Block	15.780	4	.003
	Model	15.780	4	.003
		Model Summary		
Step 1	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	
	72.855 ^a	.034	.192	
a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.				
		Classification Table ^a		
		Predicted		
		Spiritual impact		Percentage Correct
Step 1	Observed	No	Yes	
	Spiritual impact	No	Yes	
	No	1	8	11.1
	Yes	0	451	100.0
	Overall Percentage			98.3

a. The cut value is .500

The last part of the analysis, is the Variables in Equation (George & Mallery, 2016) presenting the 4 predictors that influences the perception of the people that their spiritual well-being was affected. The study found that perceived worried ($p=.035$) and physical well-being affected ($p=.039$), are the most important predictors whereas gender ($p=.45$) and mental well-being affected ($p=.64$) did not. The odds of people who perceived their physical well-being was affected by climate change to be affected spiritually were 8.09 times greater than those whose perceived their physical well-being was unaffected by climate change. For those who were worried by climate change, the odds were 2.69 times more likely to be affected spiritually than those who were not worried. This means that based on this sample, the needs of the people who are worried by climate change and considered that their physical well-being is also affected by climate change need to be addressed in adaptation strategies (Table 4).

Table 4: Results of binary regression analysis on impact on perceived spirituality

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Gender	.555	.739	.563	1	.453	1.742	.409	7.417
Worried	.989	.468	4.466	1	.035	2.689	1.074	6.730
Step 1 ^a Mental impact	-.646	1.393	.215	1	.643	.524	.034	8.034
Physical impact	2.091	1.012	4.274	1	.039	8.096	1.115	58.800
Constant	-2.241	1.876	1.427	1	.232	.106		

a. Variable(s) entered on step 1: Gender, Worried, Mental impact, Physical impact.

To support the above stated results, a contour plot (Ryan, Joiner, & Cryer, 2013) was conducted to show how these 2 important parameters (worried, physical impact) were related to spiritual well-being impact. The emerald green region indicates higher spiritual well-being impact and the blue region with lower spiritual impact (Figure 3). This relationship is significant and has yielded in a positive direction as indicated by the contour plot value to be positive and pointed to the right, with p-value table using Kendall's tau-b (Table 5).

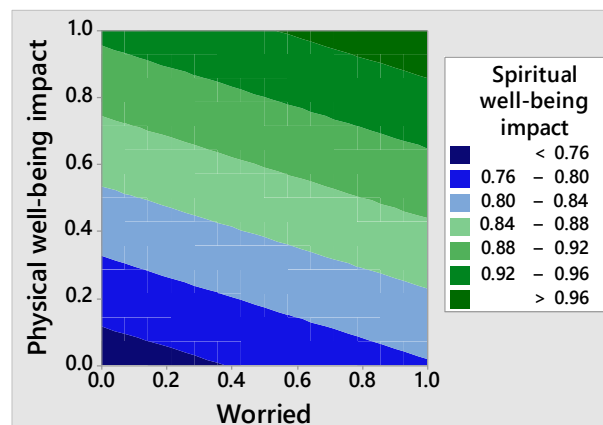


Figure 3: Contour plot of spiritual well-being impact vs physical well-being affected, worried

Table 5: Correlations with gender, worried, mental, physical and spiritual well-being impact

	Gender	Worried	Mental impact	Physical impact	Spiritual impact
Gender	----	-.001	.010	.024	.024
Worried	-.001	----	.276**	.233**	.136**
Mental impact	.010	.276**	----	.466**	.174**
Physical impact	.024	.233**	.466**	----	.260**
Spiritual impact	.024	.136**	.174**	.260**	----

* $P < 0.05$, ** $P < 0.01$.

Then, a factorial plot (Ryan et al., 2013) was conducted to assess which of these 2 significant parameters (worried, physical impact) would have the most significant interactions with perceived spiritual well-being impact. The results show that the magnitude of physical well-being impact appears to be larger than the magnitude for worried (Figure 4), with an exponentiation of the B coefficient (odds ratio) of 8.096 higher than 2.689. This has indicated that in terms of adaptation strategy, actions to reduce the perception of physical well-being being affected should be given priority compared to actions to reduce worry about climate change.

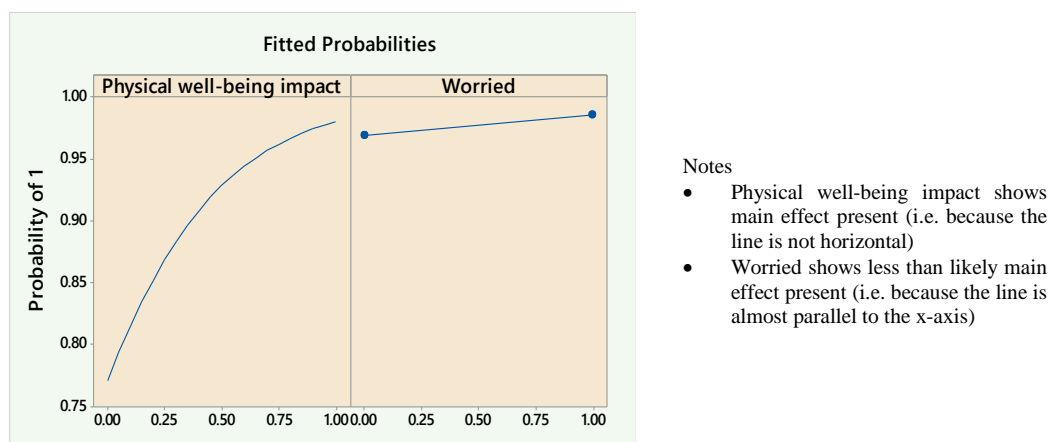


Figure 4: Main effects plot for spiritual well-being impact

Qualitative Analysis and Results

Themes that Emerged in Interviews and FGD

Several themes emerged from a careful review of the transcripts in reference to the perception of climate change impact on spirituality and adaptation strategies. Here, six of these themes are described, which helps guide the spiritual adaptation strategies for these coastal areas and communities.

‘Dirtiness is a representation of evil spirits and if that evilness/evil spirits invaded your body, your spiritual well-being has as well become evil and so unhappy’: A guide to spiritual adaptation for these coastal areas and communities and Tonga

In several of the transcripts, participants expressed a belief that “heavy rainfall” and “flooding” affect spiritual well-being. For example, a female participant from Popua stated: that she “don’t know what to do” especially “when the water started to be coming under the main door inside our house.” The problem here is that because when the “heavy rainfall finished, it brings a lot of rubbish and different kind of debris surge. If we can’t try our best to clean it as quickly as possible, it will cause diseases and may threaten the health of our children as a consequence of leaving those rubbishes and dirt at home.”

This response suggested that “Dirtiness” in the form of filthiness “is a represent of evil spirits and if that evilness invaded your body, your spiritual well-being has as well become evil and so unhappy”. As stated by the participant, this perceived spiritual impact can affect nuclear and extended families, as well as the environment. She stated explicitly: “That goes to our extended families as well. When evil spirits invaded our families, we started to see fighting and conflict between family members even you and your own kids and the same thing happen to your own environment too. That’s what happened to me and my life in my own families.”

‘The most important thing my families value are the church and education, although we prioritised, but we put God first’: Because God made this universe and he is the only one who can reverse these impacts of climate change and natural hazards from these coastal areas and communities and Tonga

This theme emerged when participants discussed how their spiritual well-being were affected by climate change and/or natural hazards. This has often come up especially in response to the interviewer’s question: “What about the impact of climate change on the sources of well-being of you or your families in your household have? In this context participants always referred to God and the Bible. As one female participant from Manuka has put it: “The most important thing my family values are the church and education, although we prioritised, and put God first. Another male participant from Manuka, added on to this discussion by stated implicitly: ‘Our family priority, is going to church. God controls everything in this universe.’”

“For example, if you want wisdom and understandings, and you asked God, then God will give it to you. So, the best overall well-being is to set your priority right, and put God first. I mean, you have to keep your relationship and fellowship with God, by worshipping and reading God scriptures. You see, for me, I am a Minister here in the Assembly of God, and now I am the

Assistant Minister in our church. For me, it is such an important thing to read my Bible and praying to God in secret, before going to work in the morning. When I drive in the road to go to work, I know that God is protecting me. By doing that, I know that God is giving me, what I was asking for, so to improve my overall well-being.”

From a spirituality point of view, this may mean that participants who perceived God send these impacts, also believed that he is the only one who can reverse them from affecting their coastal communities as well as the general population. Therefore, by keeping their faith and praying to God, the Christian God can reverse these impacts from these coastal communities and save them, their families and to all the people of Tonga. This Tongan worldview and interpretation of the Bible, however, are different from the perception of most of the western world in Europe, USA and even Australia although they have been reading the same book (Ipsos MORI, 2014; Leiserowitz et al., 2015; Morrison et al., 2015; Nunn et al., 2016).

‘The churches were destroyed, and most people commend that in this day, they believed that it is more like the judgement day for them and this is a part of God’s plan’: A sign of the second coming of Christ, therefore repent and turn to God for adaptation and safety as Christian in these coastal areas and communities perceived as what is impossible for men are possible with God

Several participants mentioned that they perceived climate change to be an indication of the judgement day, which affect their spirituality indirectly. A female participant from Kanokupolu was saying: “I still remember in the tropical cyclone Isaac in the 1980s, in that year in 1982, the tropical cyclone Isaac threatened and devastated almost every household in this community, livestock’s, as well as individuals. The sea water pushed them to the other side of the village with everyone floating in the water. The churches were destroyed too, as far as I remembered. And most people commend that in this day, they believed that it is more like the judgement day for them especially the older people in their 60s and 70s. We were trying to safeguard them to a safer place.” When she was asked to reflect on climate change as Christian, she said: “I know that I am a Christian, because of the church that I belong to. I do believe these climate change and impacts are part of the God’s plan. Because there is nothing that God cannot do – “ko e ‘Otua ‘oku ne mafeia ‘a e me‘a kotoa pe”. What we need to do though as Christian is to follow exactly what the scriptures dictated us to do. Nature is a true representation of God himself. If we try to solve nature (e.g. climate change) by our human intelligence, we can’t do it. Like Tonga, we should be proud that our great King George Tupou I have devoted that my “God and Tonga are my inheritance” (Ko e ‘Otua mo Tonga ko hoku Tofi‘a). So, worship and

prayer is always part of our culture so we need God to help us understand nature and solve this problem.”

‘A form of punishment to teach us a lesson to change our lives because we know that Tonga is so different now’ – So to turn to God and ask him to reverse the impacts of climate change and natural hazards from these coastal areas and communities, thus help making a Resilient Tonga to 2035 and beyond as we are God’s children

This theme emerged when participants perceived that climate change is a punishment from God. A female participant from Popua was saying: “To me, this impact of climate change is more like a form of education to educate us or to punish us so to open up our mind and know what to do. God does not want us to suffer. It is more like God is educating us to look after our families better. It is also like a form of punishment to teach us a lesson to change our lives because we know that Tonga is so different now. We all know. Our young people now is way more different from what we’ve seen in the past. God doesn’t want us to struggle. But it is like God is teaching us a lesson that we know what to do and how to behave in such a manner as we are his children.” From the adaptation point of view, this means that people in Tonga should turn to God and pray to him to reverse these impacts from affecting them because he is the only one who can do it, and most importantly contributed to make Tonga a more resilience nation by 2035 (Government of Tonga, 2016) and beyond. This interpretation of the Bible by the Tongan Christians in terms of climate change impacts and adaptation seems to be different from other nations, although they have read the same book (Ipsos MORI, 2014; Leiserowitz et al., 2015; Morrison et al., 2015; Nunn et al., 2016).

‘The churches were destroyed’ and ‘If I missed going to church’, ‘I don’t feel spiritually occupied on that day’ – So using Church (and State) to care for the most vulnerables in these coastal areas and communities and for Tonga is significant

This theme connotes that when climate change affected people’s going to church to praise God it affects them spiritually. A female participant from Manuka was saying: “I’ve always prioritised church to come first. I am a preacher, and since, I was young, I’ve always put God first. I am the principal of the Sunday school in our church, and we are the maintenance steward. Every day, I read my Bible and always do my prayer in secret, as in daily bread devotions. I have attended all the church services, although, there will be climate change like rainfall and so on. Sometimes, however, I missed it due to some extreme natural events, but when I stayed home, I never go to sleep, rather, I keep on reading the scriptures. I don’t feel completely spiritually, fully occupied on that day, because I wanted to go to church and praise God by singing.” As indicated in this transcript because church play a significant role in satisfying the

participant's spiritual well-being, by using it as a tool to tackle impacts of climate change on the ground would help people spiritually, and most importantly find peace, happiness and/or solutions to their problems effectively.

'Sometimes warming climate usually got me sick so easily like flu viral illness, asthma, and shortness of breath' – Similarly people spiritual health and/or well-being will be affected, concurrently and this need spiritual support and adaptation

This theme denotes impact of climate change on physical well-being in the form of perceived impact of climate change on health which simply affected a person's spiritual well-being. A female participant from Kanokupolu stated: "The only time that I usually get sick is when there is climate change like a lit bit hotter. Sometimes warming climate usually got me sick so easily like flu viral illness, asthma, and shortness of breath. And it usually happened somewhere around November, December up to February during our wet seasons. During these times of the year, I usually get those illnesses. And even nowadays, I felt that climate change is getting worse, because it feels even hotter, during days and at night times, so there is no much of a difference at all. And especially flu, common cold, coughing and rhinorrhoea, it usually affects me."

The relationship between impact of climate change on health to spiritual well-being can be translated by when people are sick because of climate change-related conditions their spiritual well-being will be affected, simultaneously (GOV.UK, 2013, 2014; Government of Tonga, 2015, 2016). So, supporting people spiritually is vital to their overall health.

Discussion

Perceived Impact of Climate Change on Spirituality and Spiritual Adaptation for Five Coastal Areas and Communities in the Tongan Christians Mind

Despite a considerable body of literature (IPCC, 2014b; McIver et al., 2014; Nunn et al., 2016; World Health Organisation (WHO), 2015) devoted to climate change impacts and adaptation strategies to coastal areas and communities, there is little discussion on the literature on the effects of climate change impacts on perceived spirituality and spiritual adaptation. To date, the theoretical and empirical work on impact on livelihood, health and well-being capital has shown limited sensitivity to the impact on perceived spirituality. The current study sought to redress this deficiency in literature.

The paper sought to capture the perceived impact of climate change on spiritual well-being in Tongan Christians aged 15 to 75 in five coastal areas and communities in Tongatapu, Tonga.

A large majority of people perceived that their spiritual well-being was negatively affected by climate change. The study found that women's and men's spiritual well-being was affected by climate change, mainly because they value church significantly, were worried by the impacts of climate change on them or because of the physical impact caused by increasing sea level rise, heavy rainfall, extreme weather events, temperature change (hot and cold), drought, and seasonal shift (for example overlapping of seasonal changes from wet to dry season and vice versa in Tonga), compared to those who were unaffected.

The quantitative and qualitative findings in this study highlighted the significant differences between people who perceived their spiritual well-being was affected (n=451) and those unaffected (n=9) ($\chi^2(1)=424.704$, $p<.005$), (see Tables 1-2). This is a very important information for Tonga because it shows that the vast majority of the population is affected spiritually by climate change so spiritual adaptation is needed. One female participant stated explicitly how climate change had affected her and her family members: "Dirtiness is a represent of evil spirits and if that evilness invaded your body, your spiritual well-being has as well become dirty and so unhappy." This excerpt illustrated severe affliction to the sense of spiritual well-being because people visualised and conceptualised climate change and dirtiness using the insight of evil spirit (as in laumālie 'uli). In the same way, when that evil spirit invaded their bodies, as the participant stated, it will have caused them to be unhappy, and so affected their spiritual well-being as well.

The link of dirtiness with physical well-being affected and worried is via the insights of evil spirits (laumālie 'uli) as conceptualised from the Bible (Bible Society of the South Pacific, 1966). In the study, participants discussed dirtiness as a Tongan metaphor of evil spirits, and when this demonic possession in the form of evilness invaded their body, it affected their mental state of health, their physical health and thus lead to madness (puke faka-tevolo), anxiety, worried and/or depressive disorder (puke faka-'avanga), which eventually would have affected them spiritually. This was concordant statistically, which shows that those whose physical well-being was affected ($p=.039$) and worried ($p=.035$) are most likely to be affected spiritually (see Tables 3-4). Most significantly, as people's general state of unease increased, their physical and/or mental status would be reflected in their spiritual well-being as well (see Figures 3-4). And since climate change being a very significant source of worry in coastal communities in Tonga because of sea level rise and people perceiving climate change to be responsible for several physical illness, it is therefore to be expected that it also impacts negatively on people's spiritual well-being.

Perceived impacts of climate change on physical well-being ($p=.039$) and worry about impact of climate change ($p=.035$) emerged as major predictors of negative impact on spiritual well-being, whereas gender ($p=.45$) and mental well-being affected ($p=.64$) did not (Michaelis, 2011). As one woman from Popua stated when she linked her worries and physical well-being affected to God's punishment: "To me, this impact of climate change is more like a form of punishment to teach us a lesson to change our lives because we know that Tonga is so different now." Clearly, this excerpt alone suggests that the participant was spiritually affected because she used words like "punishment", "teach", "lesson", "change", "lives" to express her fear of God and climate change (Roser-Renouf et al., 2016; USGCRP, 2016). And, because of the church she belonged to (FWC) and her perception from the Bible (Bible Society of the South Pacific, 1966), it designated her responses to refer to her God for peace and comfort, since no one in Tonga believe that climate change does not exist.

This interpretation of the Bible by the Tongan Christians who advocates climate change are different from the same Christians in Australia, USA, UK and Europe who are climate change denier's and sceptical, although they all read the same book (Ipsos MORI, 2014; Leiserowitz et al., 2015; Morrison et al., 2015; Nunn et al., 2016) but people in Tonga see and experienced climate change impacts everyday. Since these impacts have led Tongans to reference the protection and guidance of God from the Bible (Bible Society of the South Pacific, 1966), therefore they perceived that the Holy Scripture can be used to manage climate change adaptation and disasters management as well (Government of Tonga, 2015).

A female participant from Kanokupolu explained explicitly how climate change affected her physical well-being in the form of sickness by referring to asthma, shortness of breath, viral illness like flu, common cold, coughing and rhinorrhoea: "The only time that I usually get sick is when there is climate change like a little bit hotter" has "got me sick so easily like flu viral illness, asthma, and shortness of breath, flu, common cold, coughing and rhinorrhoea." From this passage, it showed that because the participant was ill due to climate change such as temperature change variability, it affected her well-being physically in the state of human health and physical well-being and people merging climate change and climate variability is a sign of worry that climate change cause to the people. For the general population, this may mean that they need to be well cared during the wet season (Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2014; Tonga Meteorological Service, 2015, 2016) in Tonga.

Another female participant from Manuka, explained how climate change was affecting her spiritual well-being because it has affected her schedule to go to church to communicate to God to improve her spiritual well-being. This is such an important well-being impact in the context of Tonga because people who prioritised God in the form of church in the study, may mean that if their programme to attend church activities was affected, consequently it may have influenced their spiritual well-being negatively. As a female participant stated explicitly: “I have attended all the church services, although, there will be climate change like rainfall and so on. Sometimes, however, I missed it due to some extreme natural events, but when I stayed home, I never go to sleep, rather, I keep on reading the scriptures. I don’t feel completely spiritually, fully occupied on that day, because I wanted to go to church and praise God by singing.” But because she did not go to church, it makes her worried and affected her spiritual well-being.

This is important because, from this excerpt, it is clearly indicated that this woman’s priority is by going and attending church services and like everyone else who have faith and trusted in God (Bible Society of the South Pacific, 1966). As expressed and argued by a woman from Kanokupolu: Because climate change is nature, and “nature is a true representation of God himself”, therefore, worshiping and praying to their Christian God, in her spiritual faith as a Christian, is the only way to help Tonga solve this problem, since King George Tupou I dedicated Tonga to God for protection in 1839 that “God and Tonga are my inheritance” (Government of Tonga, 2015, 2016; Sekona, 2014).

More interestingly, when she also claimed that our human intelligence cannot solve the impacts of climate change, rather that only the Christian God can, has underscore how devoted some Tongan Christians are, even referring to themselves as “God’s children”. As a result of this paper supporting people’s who perceived climate change is affecting their spiritual well-being negatively, it can then be used to support a policy proposal for the Government of Tonga and the National Council of Churches to scale up CCA. This can be done through preaching, fasting and a national prayer initiative, to pray to their Christian God to reverse the impacts of climate change and natural hazards from affecting people’s spirituality. In doing so, these concrete actions could give people a feeling of actively respond to what is written in the Scriptures and make them feel less worried.

Then, promote integration of spiritual adaptation into their roles in their families, churches and

communities. In doing so, this would help Church and State achieving a better Resilient Tonga by 2035 (Government of Tonga, 2016) and beyond, thus developing a spiritual coping mechanism that offers a unique role in promoting happiness and peacefulness for people who perceived their spiritual well-being was adversely affected. This can be achieved by looking into the impact of climate change on spirituality for the Pacific or other island states beyond the Pacific (Luetz, 2017) in order to address the spiritual needs of the people in the Pacific to inform a more holistic regional adaptation plan that can more auspiciously meet the Sustainable Development Goals (SDGs) and Sendai Framework for Disaster Risk Reduction (DRR). Since spiritual well-being is vital for the people of Tonga, it needs to be included in the CCA strategies. However, these strategies need to target the identified predictors, by improving the physical well-being of the people, reducing the physical impacts of climate change and reduce their worries. First, this could be done through CCA project. Second, this may be done in relation with Pastors and churches to reassure them and give them hope by empowering and providing them with information so that they can be part of CCA project and then actively participating in actions that support the teaching of the scriptures.

Conclusion

In conclusion, the main lessons from this paper can be summarised as follows:

- Climate change had affected people's spiritual well-being, negatively;
- Climate change was viewed as punishment from God, but this result in a positive approach to well-being adaptation in order to please God;
- People in Tonga use the Holy Scripture to adapt to climate change;
- Spiritual adaptation in the form of praying or spiritual counselling and rehabilitation should be focused on people who are worried, stressed, and feel anxiety or fear of climate change and whose physical well-being was affected;
- People faith in God has helped them adapt to climate change.

Based on these lessons learnt, the paper recommended that this will be useful to both the State and Church actors – where people in the communities must include in the adaptation strategies, to ensure that the approach is holistic. By doing so, people will be implementing it in the sense that it is the will of God, thus making them more responsible and feel that they own it, since they believe it is what the scriptures in the Bible wanted them to do so. This is how CCA should be incorporated into the government national adaptation action plan and church agenda's, and then use church to co-implement it with them, concurrently meeting both people spiritual needs

as well as the requirements and tents of science, in order to achieve Resilient Tonga by 2035 and beyond (Government of Tonga, 2016).

For the future, in order to provide a better understanding about how spirituality improves quality of life and heal people who are affected by climate change, further study is still needed in this area for Tonga and the Pacific. This could be a research:

1. To investigate if improving people's spirituality would help them healed their sickness and health (e.g. helping in healing people who are living with malignant cancer, HIV/AIDS or NCD). And if so, does improving spiritual well-being promote peacefulness in them?
2. To find out if the Church and State need to work together closely in addressing spiritual well-being or not. This is an important factor in people's lives to improve overall happiness, peacefulness and enduring their world of religiosity/spirituality in Tonga.
3. To investigate how Christian God's may help Tonga address impacts of climate change and natural hazard on people spiritual well-being, thus co-benefits other human factors as well.

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