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Assessing the Potential Role of Education as a Tool for Adaptation to Climate Change in two Rural Communities in Solomon Islands.

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Abstract

More than 85% of the Solomon Islands' population live in villages and communities within 1.5 km from the coast. Therefore, these communities are exposed to extreme ocean-based events, whose intensity and variation are expected to increase due to climate change. The government realises the expected devastating impacts on the population, and has partnered with aid-donors to invest millions of dollars in climate change related programs, especially mitigation, adaptation and transformation strategies in rural communities. This paper describes people's perceptions of the role of education as an adaptation and transformation tool to cope with negative impacts from climate change. We describe the situation of two study sites in rural communities in Solomon Islands. One study site covered Oibola Village, Langa Langa Lagoon, Malaita Province, in 2013. The second study site covered communities of Keigold and Mondo, Ranogha Islands, Western province, in 2015. In both locations, we identified that communities were applying a climate change focused education that can be considered a useful model for adaptation to climate change to be replicated in other rural communities in Solomon Islands. In both study sites, we found converging insights with regard to participants' strong beliefs that formal education provided a long-term adaptive mechanism to climate change and extreme environmental events.

Key Words: Adaptation, Climate Change, Communities, Formal Education, Extreme Environmental Events.

Introduction

The Solomon Islands is located in the Southwest Pacific about 1,900 km northeast of Australia with about 996 islands stretching in a 1,450-kilometer chain southeast from Papua New Guinea (Coleman & Kroenke 1981). It has a population of around 537,000 inhabitants who share a total land area of approximately 27,500 sq km. The majority (85%) of the population live in rural areas (Gagahe 2011). Rural communities in Solomon Islands have been shown to anticipate tangible rehabilitation and reconstruction programs in their villages, implemented by the government and development partners, to adapt to the increasing impacts of climate change (Solomon Islands Government Household Survey, 2015). The expectation is particularly great amongst villagers who have been previously affected by natural catastrophes, extreme weather events such as earthquakes, tsunamis,

cyclones and tropical storms, landslides, coastal erosion, and coastal inundation. Since the majority of communities live within 1.5 km from the coast, villagers will continue to experience threats from extreme environmental events (hereafter, EEEs). Different strategies are usually recommended to communities for building resilience to such exposures. Villagers are usually open to receiving assistance from government, development agencies and NGOs, whose programs may include the participation in relocation programs, adoption of new technologies or the investment in building adaptive capacities. Given the “come and go” nature of such programs, all those long-lasting effects initiatives will be more effective. It is argued that one approach to a longer-lasting effect is to include an education component. Eakin (2005) identifies adaptive capacity (to climate change) as those characteristics of an individual, household or population at a specific location that allows them to manage climatic risk, including extreme environmental events; these being functions of wealth and education.

Managing risks from extreme events and disasters, including weather events, as part of climate change adaptation, is a challenge for small island developing countries. The Intergovernmental Panel on Climate Change (IPCC) has put special attention on outlining variables that communities could improve to combat the impact of extreme events (IPCC 2012). The report also elaborates on mitigation options and demonstrates how innovation and change have expanded the availability and effectiveness of adaptation. For example, new technologies and infrastructure development can increase the resilience of human systems while reducing adverse impacts on natural systems. Investments in technology and infrastructure rely on an enabling policy environment, access to finance and technology, and broader economic development that builds capacity.

Knowledge and education are recognized as key components of disaster risk management (Shaw et al. 2010, UNICEF 2011), and thus play a key role in adaptation capacity when making decisions at a community level. Adaptation cannot be attained if there are no financial resources, technology transfer, cultural or social support, nor in the absence of educational, managerial or institutional frameworks to transmit the process (Pelling 2011). The IPCC (2012) states that better education and training are required. However, as Pelling (2011) highlights, villages or communities need to move from resilience to transformation if they are to effectively adapt to increasingly adverse impacts from climate change. The report states that education is a critical factor for the shift from resilience to transformation. This is also the case in other parts of the world, beyond small island developing countries. For example, Paavola (2008) determines that education is important for building long-term adaptation to impacts of climate change and extreme events in a study in Morogoro, Tanzania. Paavola (2008) states that public spending and programs on health, education and wellbeing are needed in order to build adaptive capacity for communities. Similarly, Eakin (2005) illustrates that institutional change, climate risk, and rural vulnerability were important concepts when trying to introduce any effective adaptation measure at the local level, and demonstrates the importance of wealth and education in a case study in Central Mexico.

There is often enthusiasm expressed about the potential economic benefits provided through education, which could fund adaptive capacity measures by communities (Behrman & Stacey 1997; Cost 2015). However, this increased adaptive capacity covers a wider set of values than purely wealth creation, increasing the options to individuals and families, wealth creation being only one facet of the needed transformation. Community members must also realise the importance of education towards increasing their adaptive capacity at the rural village level. To achieve a meaningful

transformation, ethical concern for social and environmental justice should drive the paradigm of changing from resilience to transformation (Pelling 2011). Therefore, education, including the above social and environmental components, has to be driven by the community. Thus, values associated with cultural traditions that promote community well-being, and those spiritual values that consider the local environment, in terms other than as a mere resource, are of special concern (Morrison 2008; Morrison & Singh 2009; Morrison 2012; Morrison 2016). These values emphasize that adaptive capacity is part of a process within a learning system intrinsic to human ecology.

Education can be broadly classified as formal and informal. Formal education is that which is promoted and delivered by the government within schools, while informal education is that which is provided traditionally, within community and home settings. While traditional education includes the typical traditional values that go beyond pure wealth creation, formal education about climate change can add to these traditional values and knowledge about adaptation at the community level, thereby improving the local adaptive capacity (Morrison & Singh 2009, Morrison 2016).

Formal education is therefore not only important for adaptive capacity due to the potential economic benefits it can bring, but also due to its role in explicitly teaching about climate change adaptation. It is helpful for climate change adaptation to be promoted in schools, beginning at the primary and secondary school levels, and mainstreamed into the entire education system (Pielke *et al.* 2007). However, resources for education pertaining to climate change and simple rules to guide adaptation decisions have been limited (Fankhauser *et al.* 1999). A better understanding of the potential transformative role of formal education could help address these limitations.

Research positions and objectives

This study starts with three main positions in mind: Firstly, that formal education is part of a transformation process involved in adaptation to the impacts of climate change and extreme weather events. In such a context, adaptation to these events cannot be understood merely as making an existing set of a community's social-ecological processes more resilient.

Secondly, we state that one facet of the transformation involved in climate change adaptation is the increasing option for wealth creation provided to individuals and families through formal education. Formal education has the potential to assist young people to earn qualifications that enable them to find employment and hence improve their family's economic response capacity to climate change and EEEs.

Thirdly, we propose a second facet of the transformation, that formal education can support climate change adaptation through the expansion of existing informal cultural learning systems about community well-being and the local ecosystem. New technologies to extract resources, for example in fishing, require new guidelines for environmental management and social organization.

The main objectives of this study were twofold: to discover whether or not the potential role of education was recognized and adopted by villagers of two rural communities in Solomon Islands that have suffered EEEs, and to discover whether or not they perceived any benefit from education in adapting to climate change. We sought to understand this by identifying and comparing the perceptions of villagers concerning education as a tool for adapting to climate change and extreme environmental events.

Study sites

The study covers two sites and three communities, all of which are impacted by climate change and EEEs. The first community, Oibola village of Langa Langa Lagoon in the Central Malaita Province, is dominated by villagers who have traditionally depended heavily on marine resources and fishing for livelihood during the past century and are commonly known as the 'saltwater people'. The second site is in Mondo and Keigold villages, in the Western Province of the Solomon Islands.

These two sites were chosen since they are impacted by climate change, especially through sea-level rise. They are both also involved in conservation and rehabilitation of their resources as part of a resilience program for adaptation to the impacts of climate change. For example, the Oibola community was supported by WorldFish¹ – a Non-Government Organisation (NGO) conducting mangrove rehabilitation programs (Albert & Schwarz 2013; van der Ploeg *et al.* 2016) by way of the SWoCK² project on backyard farming supported by UNDP³.

Study Site 1- Oibola Village

[INSERT FIGURE 1]

In comparison to Keigold and Mondo, the Oibola community residents face the impacts of climate change through immense pressure on their food security. Oibola community residents simply do not have adequate land available for family farming and other agribusiness, and therefore gather much of their food from the ocean. This has forced the community residents to depend highly on cash-flow to support their families. The high degree of dependency on marine resources has become unavoidable and the introduction of adaptation programs are a necessity. Relocation or re-settlement is, however, not an immediate option because of land ownership issues. Beside this, the Langa Langa Lagoon people traditionally were not farmers but fishermen and fisherwomen. According to our research findings, both men and women at this site spent more than 95% of their time on non-farming ventures to sustain their livelihood. They have been depending on fishing and marine resources for the last hundred years.

Study Site 2: Mondo and Keigold Villages

[Insert Figure 2]

The objective for the creation of Keigold village was to resettle the people who moved from Mondo after a tsunami destroyed or damaged their houses in 2007. The new location is 145 meters above the sea level. The population of Keigold was 480 people in 2015, spread across 82 households. New homes were built after the disaster, and residents were able to make new gardens, plant new crops and begin rebuilding their lives. However, approximately 10% of the population decided to remain at the old Mondo village. These villagers cited cultural and religious beliefs and land ownership as some of the reasons given for not relocating to Keigold village.

¹ WorldFish is an NGO whose mission is to reduce poverty and hunger by improving fisheries and aquaculture over the world.

² SWoCK- Strongem Waka lo Community Kaikai : Resilience in Agriculture and Food security in the Solomon Islands

³ UNDP - United Nation Development Program, country office in Honiara, Solomon Islands

Material & Method

We used primary and secondary data as part of a research project that assesses ways to achieve long-term resilience to climate change and EEE impacts in Oibola village, Malaita Province, and Keigold and Mondo villages located on Ranogha Island in the Western Province, the Solomon Islands.

The fieldwork at Oibola village was conducted between 2nd May and 8th June 2013, and villages of Keigold and Mondo between 15th September and 9th October 2015. We used primarily qualitative information obtained from semi-structured interviews with selective community leaders and youths. The interviews covered a series of questions focusing on the respondents' perceptions with regards to the role of education to assist them in adapting to climate change and EEEs.

Qualitative Methodology

The research team employed qualitative methodology to guide the data collection and analysis. This was chosen for its increased ability to understand complex situations with textual descriptions of how people experience an issue or context (Silverman 2006). Multifaceted situations can often be better explained qualitatively, rather than by relying solely on measurement through a quantitative approach. For example, it provides information about the 'human side' of an issue, such as: contradictions in behaviours, beliefs, emotions, opinions, perceptions and relationships of individuals to groups. Qualitative research methods are also effective in identifying intangible factors, such as societal or social norms, socioeconomic status, and gender roles in a community, ethnicity, and religion, to explore potential influences in a situation that may not be otherwise readily apparent.

Interview Questionnaires

The research team used semi-structured questionnaires to conduct interviews. This type of questionnaire was employed because they tend to be conversational and informal in tone (Longhurst 2003; Horton *et al.* 2004). This approach was taken for this study because it allowed interaction with the respondents' feedback regarding their perception on the importance of education for transformation and adaptation to climate change. This method was employed in the hopes of developing openness and soliciting honest answers in discussing both the questions and responses.

A total of 90 respondents were interviewed during the visits, with one member randomly chosen from each selected household to be interviewed. There were 87 households from Oibola village from whom the team interviewed 40 respondents, representing 46% of the village. In the villages of Keigold and Mondo there were 82 households, and we interviewed 50 participants, accounting for 61% of the study site. Through this approach, we surpassed Kotrlik & Higgins's (2001), recommendation of covering 30% of households in order to fairly represent a given population.

Before starting the interviews, the purpose of the study was explained, namely to discover the nature of EEEs at the site, the participants' perception on the relation between these extreme events and climatic change and, how people at the village, including the respondents themselves had responded to such events. The role of education in adaptation was later inferred from these questions as a component of a broad scope research project. During later research at Keigold and Mondo villages, the principal researcher shared the story told by the Oibola village participants of how they perceived and claimed that education could solve their situation through providing a long-term adaptation mechanism for most lagoon coastal communities. Sharing the stories told by the Oibola community

was a prompt to introduce reflections on the role of education for the second study site. The intention was not to strictly compare the two sites, but rather to explore the concept as deeply as possible. It was therefore pragmatic to encourage the second site respondents to build on what was learnt from the first site.

At both sites, the principal researcher and research assistant grouped the respondents according to age and gender, that is, adult youth, elders (mostly men), women, government employees and, church leaders. The principal researcher then acted as moderator when asking the respondents about their perception of education and adaptation, ensuring clarity and coherence in the response to the question. Each group comprised 4 to 6 people, to allow the respondents to talk freely about their perceptions.

The study method aimed to discover participants' perceptions on the relocation process. For the second site, these engagements were critical to ascertain the level of support the community had for their recent relocation from Mondo community to Keigold. It was also desirable to understand which influence education played in that relocation process, from decision making to implementation, and push and pull factors in the community's long-term adaptation process. For example, respondents were allowed to provide open-ended expression of the reasons they thought relocation of their primary school to the new location was a strategic measure towards pursuing education as an adaptation modality.

The researcher anticipated spending an average of one hour per group interview, but realized the interviews needed to be longer or shorter in most cases. Communication difficulties were also anticipated, particularly with the elderly groups, due to the likelihood that the demographic only speaks their local language. To counter this problem, the research team engaged two research assistants from each project site, whom were responsible for explaining the themes and questions to the elderly villagers at these sites. All the interviews were conducted in Pidgin (the lingua franca of the Solomon Islands); however, it was necessary, in some interviews and focus groups, to translate into their local language and then translated back to Pidgin, and then to English during the recording process. Interviews were recorded by writing down their responses to each question.

Grounded Analysis of Data

Following the qualitative approach, the interview data was analysed to obtain preliminary findings about the viability of the three research positions (Strauss, 1987). Interview and focus group recordings were transcribed and then thematised along the lines of key concepts contained in the research positions for each of the two sites studied. Ethnographic details that exemplified the main themes were highlighted. Comparison of the two sites was made by interpreting the relative similarity of the thematised data from the two sites.

Findings

The findings of the study are presented under two thematic areas within education as a tool of adaptation. The first theme is the indirect benefit of education for enhancing adaptive capacity by providing economic benefits. The second theme covers the perceived importance of explicit education about adaptation to climate change, including the need for better use of the environment. Table 1 shows the level of education of respondents from two sites.

[Insert table 1]

The Indirect Benefit of Education for Adaptive Capacity

The findings revealed that, amidst the increasing adverse impact of EEE and climate change, there is a need to adopt education, by individuals and household units, as a means towards adaptation. This is because education helps the communities to make informed decision over their resources. Chief Herrick of Keigold village informed the research team that education is important for adaptation at the village level. Most villagers realize its significance as one of the mechanisms for long-term adaptation at the local level, and consequently send their children through primary and secondary schools at these villages. Chief Herrick reported that more than 95% of the children in the community have now attended primary school. Although this is slighter lower than the 99% of enrolment in primary school nationwide (UNICEF 2011), it is seen to be a huge improvement over the norm in other rural communities. Moreover, about 95% of these primary school children progressed to secondary schools. On aggregate, this is higher than the record of 38% to Junior high school and 28% to Senior high school, nationwide. Overall, there was a positive perception about the role of education as a vital tool for increasing the communities' household units' capacity for adaptation.

The head teacher of Keigold Primary School, Mr. Rickson, confirmed that, even though they only have a local primary school, every year more than 15 students complete secondary school in other parts of the province or Honiara, the capital. At the time of the research, about 20% of households in the village had their children attending either secondary or tertiary schools in various parts of the country. More than 60% of respondents at Keigold and Mondo have expressed and have seen this as their opportunity to raise the economic status of their families, due to the expectations of better future employment opportunities for their children. Hon. Chief Herrick expressed the common hope in his own words: "I am optimistic that my elder daughter is successful in her high school examination and continues to do her first year degree in education at the Solomon Islands National University (SINU)". A similar sentiment was also expressed by his cousin, Mr. Lonsdale. "I'm positive that my girl will do well in her Form 5 exams at Buri Community High school (the closest high school on the island) and continue her tertiary education in Honiara". These respondents were characteristic of more than 65% of the interviewed parents, who hoped that their children were succeeding in their exams to commence their higher formal education.

Chief Benjamin Wale of Oibola village also shared similar sentiments about education and adaptation at his community. During the previous visit to Oibola village, he communicated to the research team that education is an important tool in assisting the community to adapt to the increasing impacts of climate change. He gave an example of his own family. He has four children: three are in the primary school and one at the secondary school level. His daughter at the time of research was doing her first year at the King George National Secondary School. In his reflection to the team, he mentioned that he had not completed his formal education and was therefore unable to adequately assist his family financially to adapt to the increasing food insecurity brought by climate change. He informed the team that, as the chairperson of the community, he is well aware of his inability and is trying to inspire his community members to encourage their children to better their education as their best option for adaptation.

Chief Benjamin also gave the further example of his own two brothers. Both of them were no longer living in the village at the time of the research because they are well educated, able to find jobs, and

had the choice to reside in Honiara or other parts of the country. Without better education, his two brothers could not have easily migrated out from the village. If they had not been able to leave, they would have both had to compete with him for the same plot of land and thereby decreasing resources at their village. Education enabled his two brothers to find better jobs and remit funds, which currently assist him in building a sea wall and barrier against sea intrusion into the family's house during high tide, contributing towards transformation in their community.

With local jobs becoming scarce, along with resources, respondents look to good education for their children as a means of transforming their families in the face of further climate change. A young Oibolan adult testified that he was forced to leave school to work as a "casual worker" in Auki, the capital of Malaita Province. His job for more than 15 years was "stevedoring", or unloading of cargos from ships at the Auki wharf. In his own words, "I needed to support my family and so I had to leave education at a very young age". The young man concluded that, having now realized that education is an important component of adaptation, he will ensure that his son shall not follow his footsteps of leaving school early. He stated that, although his income can now support his family, he must make sure that his son completes his secondary education in order that he can earn a government scholarship to study abroad.

The Perceived Role of Explicit Education on Climate Change and EEE

Besides the perception of the indirect benefit of education as explained above, education helped the communities to become aware of the need to conserve their environment as part of mitigation and adaptation to the impacts of climate change. Both community leaders had shared that before the education programs were implemented, there was little awareness and understanding of the importance to safeguard the environment. Now, after the education programs, Chief Benjamin of Oibola said that people do want to participate in coral reef conservation, parks and protected areas. "One of the main things that contribute to establishment of coral reef conservation is that people are educated and understand the impact it will have on their children because it will provide resources in the future".

The head teacher at Keigold Primary school, Mr. Rickson, also stated that education plays an important role in the adaptation process at the community level. The introduction of education into the communities adds value to the existing cultural learning system which the communities already have. For example, from observation, community members are easily convinced to follow what their educated elites at the community ask them to do in regards conservation, community planning and organization. If an educated community member tells the village elder or chief to conserve part of their coral reefs, then they obey and conserve the resources. This is not, however, always evident with the Oibola community, because of land scarcity and food insecurity.

Because of scarcity of marine resources, some fishermen from Oibola community resort to illegal fishing techniques. For example, some of the fishermen use explosives to kill or stun fish, mainly in the open sea, but also in coastal lagoons and coral reefs. The illegal fishing technique is used in the now devastated reefs of Langa Langa Lagoon. Explosions can produce very large craters, devastating between 10 and 20 square meters of the sea floor (Muallil et al., 2014). They kill not only the target fish, but all the other surrounding flora and fauna. In coral reefs, reconstruction of the damaged habitats can take decades. It was reported, however, that this has now started to change after people learnt the negative impacts of these devastating acts to the environment. But if there are no

alternative ways to obtain immediate resources then the pressure to do so remains high. Hence, the simultaneous need for the indirect role of education discussed above to provide other ways to obtain resources. The Langa Langa Lagoon respondents are in an extreme situation as they face land shortage. Food insecurity forces them to depend highly on cash-flow economy to survive. In such a situation, cash is needed for all livelihood activities in the lagoon. Unlike the Keigold community, which still has access to land for subsistence farming and gardening, the Oibola community depends entirely on their marine resources or cash for survival. But with a growing population, and increasing negative impacts of climate change and EEEs, they are experiencing an extremely difficult time in the attempt to adapt. Against such a backdrop, these communities desperately need financial income and thus have resorted to illegal fishing techniques, as well as forcing some youth to leave school early to find employment to support their families, unfortunately repeating the pattern from past generations that so many wish to avoid. Some of these economically limited youths expressed their disappointment with the fact that their parents could not financially support them to attend higher education. They regretted having missed the opportunity of attending school, and subsequently gave up on the future chances that schooling would have provided them, such as, to migrate to urban centres and find a good job. These forgone opportunities would have helped them to ease their dependency from the community's limited resources. The interviews revealed that youths realised what education would have brought them in terms of longer-term resilience through a transformation of their lifestyle.

Discussion

This study evidences the need for further investigation of all three research assumptions. First, education was a prominent part of a pro-active process of transformation of the communities at both study sites. Both study sites and respective communities are very diverse, with different EEEs and resource bases. Nevertheless, they both perceived the need for a transformation process to achieve a long-term adaptation. This indicates the need to consider the transformation of the socio-ecological system when considering adaptation to climate change and EEEs. It is possible to argue that transformation is a critical element in the adaptation of rural communities to climate change and EEEs. It was found that villagers perceived that pro-actively transforming their lifestyle provided appropriate adaptation to reduce or transfer the risks they faced from the impacts of EEEs, for example, in case of risks from earthquakes and tsunamis, or storms surges and floods.

Second, the access to and success in formal education, in both communities were found to be a major component of the necessary transformation in their lifestyle. In remote villages where communities are faced with natural disasters, which may lead to food insecurity, there are not many options but to take whatever immediate adaptive opportunities are available, even if they exacerbate the issues over the long-term. In this local context of limited opportunities, education is seen as the saviour to most residents of rural communities. Education potentially provides options that are otherwise unavailable. These include opportunities for migration and employment to ultimately increase the economic status and adaptive capacity of the household units. These are seen as a necessary transformation for successful adaptation.

It was generally accepted in both communities and all groups that it is vital for community members to attain the maximum possible level of education to earn more income and assist their communities, for example in planning and/or implementing education programs. Respondents expected that primary school and secondary levels are only the initial stage of education for engaging in the

adaptation process, and that ideally, more people in their respective communities should press on to attain higher tertiary education because it is, at this stage, at which community members are able to provide leadership in their adaptation process.

Third, formal education was seen to help people, of all ages, in the communities to understand and appreciate the value of their resources and to learn how to conserve these resources to future generations. Through gaining education and sharing experiences, villagers have realized: how natural resources and ecosystems affect each other; how resources can be used wisely amidst increasing impacts of climate change and EEEs, and; how wise use is a vital aspect for long-term adaptation at the community level.

Moreover, community members were found to be more likely to participate in the adaptation programs if they already had some formal education, and so already had some understanding of the negative impact that climate change and EEEs will have on their livelihood and communities. Since community members realise on the importance of education towards increasing their adaptive capacity, education has proven to be helpful in creating long adaptive capacity towards the achievement of their own transformation to cope with EEEs.

Recommendations

From our study we offer three recommendations for governments, and one general research recommendation.

A) Government must ensure that rural communities are educated about conservation. Adaptation programs are necessary to ensure village support and achieve long-term adaptation. They need to be integrated into formal education in schools, but also sought to be incorporated into village activities.

B) Governments should mainstream adaptation, mitigation, conservation, climate change and natural disaster topics into the education system, both in primary schools and secondary schools. People in rural communities will only learn the importance of education as a key means for long-term adaptation if those topics are integrated into their education system.

C) Finally, further in-depth studies are needed in order to better understand the types of transformations in lifestyle that are necessary for adaptation, and to identify the most suitable means to overcome the costs and barriers to adaptation.

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Figure 1: Map of Oibola Village, Malaita Province

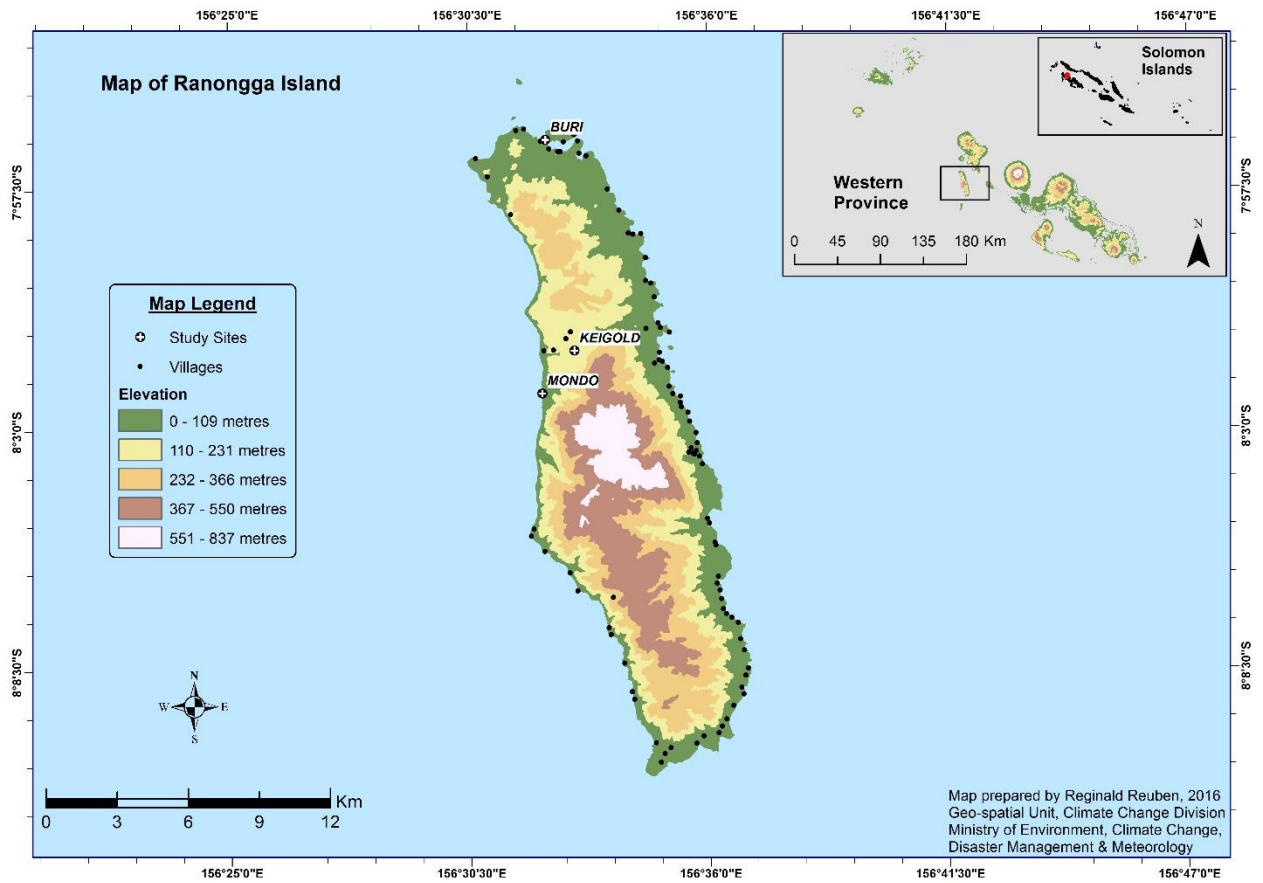


Figure 2: Map of Ranongga Island of Western Province

Table 1: Level of Education of Interviewees at Study Sites

Gender	Keigold & Mondo	Oibola
Male	60%	63%
Female	40%	37%
Educational Level		
No formal education	0%	0%
Primary School	52%	23%
High School without graduation	23%	20%
High School -complete	17%	54%
Tertiary	8%	3%
Total	100%	100%