

# **The Inequality of Vulnerability**

**Examining the Relationship between  
Inequality and Climate Change  
Vulnerability**



## Abstract

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*Inequality and climate change have emerged as dominant themes of political and social enquiry. This study aims to link these two themes to develop an understanding of the interrelationship between inequality and climate change vulnerability. How does inequality shape vulnerability among different socio-economic groups? How is the vulnerability-inequality nexus related to the process of globalization? A number of negative outcomes of inequality are associated with factors contributing to climate change vulnerability. These will be traced within a discussion of two case studies focusing on Papua New Guinea and Tonga, two countries facing enormous climate risks. The study finds that globalization creates particular environments in which climate change vulnerability may be facilitated in the absence of targeted measures. These environments are particularly susceptible to the negative implications of inequality. Thus not only is inequality problematic from the perspective of access to resources, but also in the sense that political and social institutions are less responsive to the most vulnerable segments of unequal societies. In particular, the issues which create vulnerable environments are related to formal and informal social security as well as urbanization.*

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*'[N]ature is not in itself catastrophic. The catastrophic character is only revealed within the field of reference of the society affected' (Beck, 2010: 171)*

## **Introduction**

2013 was a year of climate change. A plethora of events reinforced the notion that climate change is a phenomenon which, contrary to the discourse it is couched in at times, is already underway. The world witnessed massive floods in Central Europe, increasing drought in California, Typhoon Haiyan in the Philippines as well as extreme heat waves in coastal China. Although none of these events can be connected with climate change individually, collectively they drive home the notion that climate change is not a process taking place in the future, but indeed is very much a force to contend with in the present. According to some estimates, climate-related disaster damages globally grew from 50 billion dollars a year in the 1980s to just under 200 billion dollars in the 2000s (World Bank, 18 November 2013). In addition, carbon dioxide levels in the atmosphere reached 400 parts per million for the first time in modern history (Montaigne, 14 May 2013).

By now, it is generally accepted by the scientific community that climate change is happening, is anthropogenic, and will have negative implications globally, not only in environmental terms but also in economic and social terms. Hence, climate change emerges as a problem that, due to its global nature, faces individuals and countries wherever they may be. Yet, are there distinctions to be made? Clearly, climate change will not have uniform impacts across geographical regions and different societies. In essence, this is the question this study will grapple with. In particular, it will deal with the question whether one can discern a relationship between climate change and economic inequality as environmental and societal phenomena, respectively. In order to do so, this study will investigate how people and communities are affected by levels of inequality with regard to their vulnerability to climate change. Specifically, the study will focus on Papua New Guinea and Tonga, two countries

which are generally taken to be some of the most exposed and vulnerable to the process of climate change.

Inequality as a topic of enquiry has become frequently salient. In recent years, the International Monetary Fund (IMF) has published a number of studies focusing on the economic ramifications of inequality (Ostry et al., 2014, Berg and Ostry, 2011). Barring a sudden change of IMF opinion, this suggests that the institution is responding to a recent development that has seen inequality steadily rising as an issue of concern in public discourse. Following the financial collapse of 2008 and the subsequent instability of the world economy, inequality has moved to the forefront in academia, politics, economics and in popular literature. Academics such as Stiglitz (2012) as well as Wilkinson and Pickett (2009) have published works of popular literature focusing on the adverse consequences inequality can have for societies. In international development discussions, a number of stakeholders demand that addressing inequalities should constitute one of the essential building blocks of a post-2015 development agenda (ECE et al., 2012). In his second term, US President Obama has focused on addressing inequality as one of his second term's policy priorities, at least in rhetoric ('State of the Union', 28 January 2014). Thus, inequality is crucial when it comes to how we think about the future shape of the world.

In order to clarify the relationship between climate change vulnerability and inequality, this study will examine how these social conditions are mediated by the forces of globalization. Given that both climate change as well as inequality are phenomena which are in part caused by the process of globalization, and therefore shaped by it, such an analysis will be helpful in identifying the precise ways in which climate change vulnerability is facilitated or mitigated. In trying to understand the interrelationship between climate change vulnerability, inequality and globalization, the study will be based on a case-study approach. Following a review of the literature on vulnerability and inequality, two case studies of Papua New Guinea and Tonga will highlight a number of aspects pertinent to the fundamental issues addressed by this study. The study of Papua New Guinea highlights the role played by natural resources in the economy, and pays particular attention to the interplay between

formal and informal social security systems, while the section on Tonga focuses on import dependency, remittances and problems associated with urbanization.

This paper argues that understanding the role played by inequality is crucial in evaluating climate change vulnerability. Not only does inequality exacerbate poverty in the intermediate sense, but also creates conditions which make it more difficult to implement measures to increase resilience in the face of climate change. These challenges are mediated by globalization by virtue of the fact that it facilitates inequality, but also fosters social processes which exacerbate the negative effects of inequality. Therefore, awareness of inequality as well as globalization and their mutual relationship is critical in order to understand climate change vulnerability.

## **Literature Review**

### **Vulnerability**

Research on climate change in the natural sciences is comprehensive and well-established. Consensus exists among the vast majority of renowned scientists with regard to the existence of the phenomenon as such, as well as its anthropogenic nature (Min et al., 2011; Pall et al., 2011). Where research is still expanding knowledge significantly is with regard to the question what the likely effects of climate change will be. In this context, research on the consequences of climate change has produced a number of adverse scenarios. In particular, the frequency and intensity of extreme weather events is likely to increase. Intense precipitation (Diffenbaugh et al., 2005; Trapp et al., 2007), greater occurrences of storms and hurricanes (Emanuel, 2005) and more intense heat waves (Battisti and Naylor, 2009; Diffenbaugh et al., 2007) are all included as phenomena more probable to occur in a future characterized by climate change. Thus, in many cases it is the increased variability of weather events rather than a steady warming of the planet that leads to the most worrying threats. Crucially for small island countries, a long-term consequence associated with climate change is considerable sea-level rise (Church and White, 2011; Schaeffer et al., 2012).

In social science research, scholarship has focused on the concept of vulnerability, which has been applied with increased frequency to discussions of the sociology and political economy of climate change. Yet, it does not have its origins in climate change literature, but rather in investigations of the social dimensions of natural hazards and food insecurity (Dilley and Boudreau, 2001). Fundamentally, it builds on the notion suggested by O'Keefe and colleagues that, for the purposes of social scientific enquiry, 'without people, there is no disaster' (1976: 566). Hence, O'Keefe and colleagues argue that natural disasters are more a function of socio-economic processes rather than environmental phenomena. This emphasis is also reflected by Gallopin and colleagues (2001), whose conception of the socio-ecological system highlights the interaction between societal and ecological subsystems. It is also consistent with Cardona's suggestion of the social dimension of risk (2004: 44), which underscores the importance of societies' structures. With regard to food insecurity, Bohle and colleagues make the case that vulnerability to food insecurity is indeed socially differentiated, with different socio-economic segments of the population facing different risks (1994). While indicating that vulnerability as a concept has roots within different disciplines, Gallopin (2006: 293) also highlights that this may be one of the reasons why the concept's meaning is contested and can take on different functions depending on the subject of study. However, Kasperson and colleagues conclude that vulnerability 'appears to be emerging as the most common term in [...] discussions of the differential susceptibility of social groups and individuals to losses from environmental change' (1995: 11).

Before continuing, however, it has to be clarified what vulnerability refers to. Both Adger (2006) and Cutter (2006: 72) as well as McCarthy and colleagues (2001: 21) maintain that vulnerability fundamentally encompasses three features; exposure, sensitivity, and ability to cope with or adapt to risk. Chambers offers a basic definition of vulnerability as 'exposure to contingencies and stress, and difficulty coping with them' (1989: 1). Yet, a broad-based definition of this sort lacks clarity and provides little guidance as to who may be vulnerable under which conditions. Bohle and colleagues define vulnerability as 'an aggregate measure of human welfare that integrates environmental, social, economic and political exposure in a range of potential harmful perturbations' (1994: 37-38). This

definition underscores that vulnerability is indeed a function of different processes, some of which may be quite distinct from the natural environment as such. Emphasizing the transformative nature of vulnerability, Adger defines it as ‘the exposure of groups or individuals to stress as a result of social and environmental change’ (1999: 249). Thus, vulnerability can be identified most clearly in situations of change or transformation, when individuals or communities are disrupted or forced to make changes to their livelihoods and lifestyles. Finally, the IPCC Fourth Assessment Report defines vulnerability ‘as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes’ (IPCC, 2007: 883).

What becomes clear is that vulnerability is very much subject to the ability of those who are exposed to a threat to adapt to a given situation. Climate change would not emerge as a threat if everyone were able to adapt instantly at minimal cost. As a constitutive element of vulnerability, adaptive capacity is subject to some of the same determinants. Yet, it has an even wider application with roots in evolutionary biology. Adaptation can be traced through the emergence of three lines of inquiry. Within climate change literature, it builds on research conducted on natural hazards (Kasperson and Kasperson, 1996), food insecurity (Ribot et al., 1996) as well as optimal mitigation scenarios (Glantz, 2003: 184).

Gallopín and colleagues (1989) refer to adaptive capacity as the capacity of individuals or collectives to increase or sustain quality of life in a given environment. Walker and colleagues (2004) offer a similarly general definition of adaptive capacity as the human capacity to manage resilience. Thus, adaptation can take on many forms. It is important for the purposes of this study to note that the ways in which adaptation can take place are not limited to wholesale solutions such as migration to eliminate exposure or poverty alleviation through economic growth. Rather, adaptation happens in communities affected by climate change, and importantly is subject to the political process, which includes decisions over how resources are distributed and who is structurally privileged in building adaptive capacity. Therefore, Smit and Wandel argue that ‘adaptive capacity of individuals or households is shaped and constrained by social, political and economic processes at higher scales’ (2006: 284).

For the purposes of this study, what is most interesting is how different segments of society display different levels of vulnerability to climate change and its related events. Previous research has demonstrated that, when compared globally, developed countries display a low degree of vulnerability with generally high adaptive capacity (Tol et al., 2004). In general, Mendelsohn and colleagues (2006) argue that poor countries are likely to bear the bulk of climate change-related impacts. Toya and Skidmore (2007) have found that wealthier countries have suffered fewer disaster-related deaths on average than poor countries. These findings are echoed by Ward and Shively (2011), who identify lower social vulnerability to climate-related disasters in wealthy countries, giving credence to the intuition that wealth and the presence of developed political institutions should be correlated with lower vulnerability to environmental hazards. With particular relevance to island states, Füssel (2010) notes that the population of poor coastal countries face larger risks from sea-level rise than that in wealthy coastal countries. White and colleagues (2004) as well as Wisner and colleagues (2004: 4-6) hypothesize that the low degree of social protection measures, higher levels of poverty and vulnerability to hazards may have a cyclical relationship in developing countries. Hence, these studies suggest that there is an international inequality of vulnerability which pertains to the differences in economic and social development between high-income and low-income countries. Moreover, Tol and colleagues conclude that climate change and related global warming essentially constitutes a ‘transfer from poor to rich’ (2004: 270).

In addition to these cross-country studies, fewer studies have been produced on the differentiation of vulnerability within countries. Burton (1997) highlights that an inequitable distribution of resources can lead to increasing vulnerability. Adger notes that ‘vulnerability [...] is differentiated between and within groups through their institutional and economic position’ (1999: 251). This suggests that some groups may not only be vulnerable due to lack of income per se, but more specifically due to the same structures - institutional and economic - which lead to their poverty. Adger further refines this aspect by differentiating vulnerability into individual and collective categories. Thus, individual vulnerability is based on access to resources and the diversity of income sources as well as social status, while collective vulnerability is generated by institutional and market structures (Adger, 1999: 252). Hence,

it matters what institutional forms exist in both political and economic terms, whether social security schemes exist or to what degree people can access infrastructure on equal terms. This analysis is supported by Bohle and colleagues, who propose a three-step causal structure of vulnerability (1994: 40). Thus, vulnerability is caused by the interaction between human ecology, entitlement structures and political economy factors.

### **Inequality**

Research on theories of inequality has experienced a significant boost in recent years. A number of studies have tried to investigate the effects economic inequality can entail. Broadly, this is based on findings that income inequality in a number of countries has grown since the early 1980s (Atkinson and Piketty, 2007; Salverda et al., 2009). Hence, this study will draw on previous work in the realm of theories of inequality in order to illuminate the ways in which vulnerability to climate change and income inequality are related in the case studies.

In general, studies on inequality hypothesize two strands of explanation with regard to why certain levels of income inequality may have adverse consequences for societies. Van de Werfhorst and Salverda (2012) distinguish these into the psychosocial approach and the neo-material approach. While the former represents a more contemporary perspective, drawing on sociology and psychology, the latter can be seen to be based on more classical Marxist theories about access to material resources. The psychosocial approach is most notably associated with research conducted by Wilkinson and Pickett (2009), who link income inequality with a number of harmful societal consequences, such as higher crime rates and lower public health levels. In essence, a psychosocial approach to inequality rests upon the notion that ‘income inequality is strongly and systematically related to the character of social relations and the nature of the social environment in a society’ (Wilkinson, 1999: 526). In other words, what this means is that one should not only look at inequality in terms of the distribution of material resources, but also how it changes non-material social relations. Thus, outcomes can be adverse due to the mere social differences being created by an unequal society.

Layte (2011) further differentiates the psychosocial approach into the categories of social capital, which borrows from Putnam (1993; 2000), and psychological ramifications, such as stress or differences of status. Hence, there is an analogy here with Adger's differentiation of social vulnerability into individual and collective categories (1999). While the psychological consequences of inequality can be said to impinge primarily on individuals, the social capital dimension is more clearly a collective category which affects society as a whole. This is useful when theories of inequality are applied to an investigation of climate change vulnerability.

With regard to the psychological dimension, Lancee and Van de Werfhorst (2012) as well as Neckerman and Torche (2007) have argued that income inequality can lead to a perceived status loss among individuals, which in turn may be associated with feelings of stress. While these findings may also reveal something about contemporary concepts of success and life satisfaction, they do point to outcomes which render segments of the population less well-off in psychological terms. However, it should be noted that the association of income inequality with such psychological is contested, as some argue that factors such as status and stress should not be used in an assessment of income inequality and its implications (Goldthorpe, 2010).

In social terms, or what one might call the collective level, income inequality has been linked with a plethora of adverse social outcomes within societies. Findings have included higher crime rates (Van Wilsem, 2004), declining housing standards (Dwyer, 2009) as well as lower public health levels (Kawachi et al., 2010) and deteriorating life satisfaction (Delhey and Kohler, 2011). In general, a number of studies find that social trust levels are lower in unequal societies (Bjørnskov, 2008; Freitag and Bühlmann, 2006). However, other studies suggest that the relationship between economic inequality and adverse social outcomes is not as strong as previous studies indicate (Fairbrother and Martin, 2013).

Nevertheless, the literature highlights a number of issues precipitated by inequality. What are the mechanisms connecting these social repercussions with income inequality? McPherson and colleagues (2001) explain this phenomenon with the observation that people tend to associate with

others like them. Hence, this is very much a political explanation in that it speaks to power relations and how political and economic institutions are in part socially constructed. As a result, parts of the population may feel left out from the process, which in turn excludes them from governance. Thus, as Rothstein and Uslaner (2005) point out, the poor often fail to be represented precisely because of steep inequality levels. Such economic stratification creates the conditions in which social trust between different segments of the population deteriorates, as the socioeconomic differences grow ever wider apart. Ultimately, this can lead to a situation where the lower strata of the socioeconomic ladder become permanently disenchanted with their position within society, developing a feeling of powerlessness which can prevent them from social engagement. Hence, inequality can trigger a vicious cycle in which more inequality leads to less representation and vice versa. As a result, societies are not able to harness the potential of their members, which can, for example, make them less resilient to the impacts of climate change as social trust erodes and feelings of stress among low-income individuals increases.

By contrast, the neo-material theory of inequality and its effects follows a quite different path which derives more clearly from a political economy approach. Lynch and colleagues explain that, under a neo-material approach, ‘the effect of income inequality [...] reflects a combination of negative exposures and lack of resources held by individuals, along with systematic underinvestment across a wide range of human, physical, health, and social infrastructure’ (2000: 1202). Thus, negative social outcomes generated by income inequality are associated with the lack of access to resources among lower economic strata and the inadequate provision of infrastructure in societies with high levels of inequality. Consequently, there is a hypothesis that more equal societies are able to provide better services to citizens, while unequal ones do not make the necessary public investments (Kaplan et al., 1996; Mackenbach, 2002). It is important to note that the neo-material conception implies a weaker sense of income inequality effects. Given that the neo-material theory is more preoccupied with absolute differences rather than relative positions between individuals, it is suggested that shortages in resource access or infrastructure gaps can ultimately be remedied by measures such as progressive

taxation and welfare state arrangements. Nevertheless, such provisions are more difficult to implement in unequal societies.

When talking about theories of inequality, it should be kept in mind that causation is often difficult to establish. Van de Werfhorst and Salverda (2012) highlight that several studies use an approach towards causation labeled by Goldthorpe as ‘causation as generative process’ (2001: 8). In essence, this approach does not establish statistical causation, but rather tries to work out the conditions and linkages under which certain findings can be explained. In other words, this is a much more theoretical than a statistical approach. Van de Werfhorst and Salverda refer to a process of ‘specifying theories why inequality is related to outcomes, and putting those theories to empirical tests’ (2012: 379).

A number of authors have linked inequality with globalization. Wade (2004) finds that globalization does not have uniform effects on countries. Rather, the implications for inequality and poverty depend on a country’s economic and political development. Additionally, Hurrell and Woods (1995) point out that globalization increases the differentials in return to education and skills, which can marginalize certain groups and increase inequality. Moreover, Hellier and Chusseau (2010) argue that less equal societies are subject to the negative implications of globalization, such as unemployment, to a greater extent. However, globalization may have the effect of reducing poverty while increasing inequality at the same time, the prime example of this conjecture being China. Thus, as Wan and colleagues (2007) argue, globalization has facilitated the growth of rural-urban income inequality in China. Thus, the relationship between inequality and globalization emerges as a complex issue which does not invite simple answers. Hence, when studying these two issues in context with climate change vulnerability, a differentiated approach will need to be applied.

### **Inequality and Climate Change Vulnerability**

While most studies have focused on the relationship between poverty and climate change vulnerability (Ahmed et al., 2011; Hardoy and Pandiella, 2009), inequality has remained

underexplored in the academic literature. With regard to income inequality and climate change vulnerability, Adger (1999) clearly follows a neo-material approach, citing lack of access to resources as well as income poverty as implications of inequality. In fact, much of the inequality-related literature focuses on material aspects of income inequality (Ward and Shively, 2012; Bohle et al., 1994). Ward and Shively (2012) argue that inequality is related to vulnerability in the sense that there are diminishing marginal returns of income on social vulnerability. Thus, extreme increases in income do not produce concomitant reductions in vulnerability. Therefore, inequality produces imbalances with regard to vulnerability. Even Wilkinson and Pickett, strong advocates of the psychosocial approach, seem to suggest that a neo-material approach may have more relevance in the context of an analysis of low-income countries (2009: 30). Yet, it is not necessarily clear that many of the same conditions do not hold in low-income settings as well.

It is also important to note that arguments have been put forward in favor of inequality. Hence, Baland and Platteau (1997) highlight scenarios where an unequal distribution of resources can lead to more efficient outcomes. Scott (1976: 51) refers to the importance of the moral economy, suggesting that if wealthier individuals act morally in times of crisis then inequality may be beneficial. However, these scenarios seem to be based more on thought experiments than actual social reality. Moreover, Adger (1999) highlights that the hypothetical advantages of inequality are outweighed by the structural impediments associated with it.

Thus, in general relatively little research has emerged to study the relationship between inequality and vulnerability. How does inequality constrain communities' options in the face of climate change impacts? What are the specific circumstances in which inequality and climate change vulnerability enter into a negative relationship? These areas of enquiry remain underexplored.

## **Methodology**

The South Pacific region is a vastly diverse area, spanning a massive amount of space geographically as well as displaying a great variety in terms of ethnicities. Thus, a general study of South Pacific

island states does not fall within the remit of this paper. Rather, this study will conduct an analysis of two countries exhibiting very different characteristics. For one, it will focus on Papua New Guinea (PNG), by far the most important country both in terms of size as well as economically. Secondly, the analysis of PNG will be contrasted with a second case study on Tonga. This island state is in many ways diametrically opposed to PNG, featuring different geographic, demographic and social structures. Hence, the combination of those two case studies should provide an overview of the differentiated impacts income inequality may have on climate change vulnerability.

Given the paucity of academic literature on Papua New Guinea and Tonga in terms of how they relate to climate change and inequality, large amounts of the analysis will rest on primary sources. In order to advance the argument, the case study will be based on data collected by institutions such as the Asian Development Bank and the World Bank, as well as on reports published by national and regional institutions. The particular features of Papua New Guinea's and Tonga's social and economic systems will be analyzed with regard to the possible implications for climate change vulnerability. In linking the two, the case study will be supported by the approaches to inequality contained within the relevant literature.

## **Case Study 1: Papua New Guinea**

### **Society, Economy and the Environment in Papua New Guinea**

Papua New Guinea is an unusual country. Having been administrated by Australia until 1975, its recent history has been filled with instances of conflict and political instability. In fact, it is questionable whether PNG can be considered to constitute a country at all. Due to the vast number of distinct ethnicities and the persistent lack of infrastructure to connect them, society in PNG is highly localized. PNG is often referred to as the most linguistically diverse country in the world, with more than 800 distinct languages being spoken (WHO, May 2013). As part of the Melanesian region of the South Pacific, it is by far the biggest territorial state in the South Pacific, excluding of course

Australia. Yet, it is also one of the poorest countries, not only in the region, but also when compared internationally. According to figures provided by the World Bank, PNG had a per capita gross national income (GNI) of \$2,740 in 2012, measured at purchasing power parity (PPP) (World Bank, 2014). By comparison, Afghanistan had a per capita GNI of \$1,560 in the same year, while India's amounted to \$3,910. In general, the World Bank estimated the per capita GNI of the East Asia & Pacific region at \$7,758. Hence, PNG is situated between Afghanistan and India in economic terms, and considerably below the regional average.

At the same time, the country has been experiencing rapid economic growth. In 2011 and 2012, growth averaged eight percent and nine percent, respectively (World Bank, 2014). What is significant with regard to this economic growth is the fact that it depends heavily on natural resource exports. The most recent available figures show that, in 2004, exports accounted for roughly 73 percent of PNG's gross domestic product (World Bank, 2014). Of those, agricultural raw materials, food as well as ores and metals exports made up 63.7 percent of merchandise exports. Thus, PNG seems to have been profiting from the natural resource boom precipitated by Chinese economic growth in the same way that many Latin American countries have. Thus, from an economic perspective PNG is extraordinarily linked with global markets. This same fact also means that the country is subject to fluctuations in the global economy, particularly when there are slumps in the natural resource markets.

Due to PNG's size, the country may be less exposed to some of the climate change-related threats than other countries in the region. Even though many settlements are located along the coast, a large proportion of the population lives in inland areas. Therefore, sea level rise poses less of a threat than it might in very small island countries, even though coastal areas remain exposed to it. However, PNG is likely to be subject to increasingly frequent and intense extreme weather events, such as extreme heat as well as precipitation (Inape and Virobo, 2011: 170). This may lead to a higher number of droughts, which will put agriculture in PNG under pressure.

## **Inequality, Growth and Poverty in Papua New Guinea**

While PNG is relatively poor, it displays extraordinary levels of income inequality. The last available figures, which date back to 1996, show a Gini coefficient of 0.51 (World Bank, 2014). A Gini score of zero would indicate a perfectly equal society, while a score of one represents a concentration of wealth in a single individual. The most equal countries have a score in the high twenties or low thirties. Given the lack of recent data on income inequality, the exact state of income inequality in contemporary PNG cannot be determined with certainty. However, the number of people at or below the national poverty line grew from 37.5 percent to 39.9 percent between 1996 and 2009, while the poverty gap – the mean shortfall from the poverty line as a percentage of the poverty line – increased from 12.4 percent to 15.7 percent. Coupling these numbers with the fact that GDP has risen significantly for a number of years, there is a clear indication that inequality has stayed high. Moreover, according to figures of the Pacific Islands Forum Secretariat (PIFS), the poorest quintile's share of national consumption in PNG only amounts to around five percent (2012: 10). In fact, PIFS states that PNG constitutes a 'main exception [...] where higher economic growth is associated with a relatively higher incidence of poverty/hardship' (2012: 10).

Hence, PNG seems to be a case where globalization has not led to pro-poor growth. Persistently high levels of inequality lead to a growing divide between those below the poverty line and those who manage to benefit from profits driven by the growth of natural resource exports. This process is not entirely surprising. The extraction of natural resources is capital-heavy rather than labor-heavy (Sachs and Warner, 1997: 6). Therefore, growth in this sector is not associated with rising employment numbers. What it can do is to provide the national government with financial resources to reinvest in public infrastructure and services. However, reinvestment of foreign exchange earnings is not taking place in PNG. Cammack (2009: 6-7) traces the incidence of increased growth combined with higher poverty levels to PNG's geographic features, which isolate communities from one another as well as from the national government, the state of PNG's political institutions, and the weakness of PNG's civil society.

Hence, growth in PNG is cancelled out by persistent inequality. From a neo-material perspective, this puts the low-income segments of the population who have not seen any dividends from resource extraction in a vulnerable position vis-à-vis climate change. Given that a large number in the low-income segment are dependent on subsistence agriculture, they are subject to both the potential for more adverse climatic conditions as well as the increased likelihood of natural hazards such as floods or drought. In turn, this dichotomy between highly vulnerable segments dependent on agriculture and relatively secure segments with cash-based salaries is likely to increase polarization even further. Since the potential income loss for farmers is much greater as environmental conditions worsen, inequality and climate change vulnerability enter into a symbiotic relationship.

Moreover, the same conditions which lead to enduring poverty also have consequences for climate change vulnerability. With a polarized society, resources are concentrated. Those same resources cannot be drawn on in a time of crisis. In 1997, PNG was hit by an intense El Niño event, which led to drought and a subsequent food shortage (Allen and Bourke, 2001: 155). When such an event occurs, economically less unequal countries are more resilient because individuals each have more resources to access in terms of savings, access to insurance, or being able to afford a doctor in certain situations. In the event of such an incidence in PNG, the most vulnerable are forced to sell their productive assets, which subsequently undermines their future ability to prepare for other climate-related events.

Given the argument that more equal societies also display more solidarity and social cohesion, it is likely that short-term redistribution in a time of crisis would be more swift and legitimate in a more equal society. Resources generated by taxes could be centrally administered to communities in need. However, the establishment of such a system is made difficult in PNG by economic polarization. The absence of a middle class means that taxes cannot be collected. The poor cannot be taxed, while rich individuals can use their political power to circumvent taxation. Therefore, redistribution of resources in PNG is more likely to take place on an ad-hoc basis, rather than in predictable and structural ways. This adds to individual and collective vulnerability because of the volatility entailed by the lack of state-based support mechanisms.

## **Formal Social Security**

In 1934, the economist Max Rubinow described the Four Horsemen of the Apocalypse as ‘accident, illness, old age [and] loss of a job (1934: 19). In many societies, these risks are insured against by the existence of a social safety net. However, in spite of impressive growth numbers, PNG has virtually no formal social safety net provisions. The Asian Development Bank (ADB) defines social protection as

‘the set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labor markets, diminishing people’s exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/loss of income’ (Wrondimi, 2012: 1).

The United Nations Commission for Social Development adds that social protection acts as ‘a foundation at a societal level for promoting social justice and social cohesion’ (UN ECOSOC, 2001: 6). Thus, social protection systems are linked to inequality both in the psychosocial sense as well as the neo-material sense. The ADB has developed an index to measure the extent of social protection measures called the Social Protection Index (SPI). According to the ADB’s findings, PNG’s spending on social protection measures represents a mere 0.5 percent of poverty-line expenditures, which is equivalent to only 0.125 percent of GDP per capita (ADB, 2013: 14). By comparison, the regional average for Pacific island countries is 0.77 (ADB, 2013: 23). This already represents a very low figure when compared to other regions, but PNG’s figure is but a fraction of that. This leads to the conclusion that ‘PNG is notable for a total absence of formal social protection’ (Kidd et al., 2010: 7).

The absence of such a formal social safety net poses a significant problem, given that people’s exposure to risks is likely to increase with enhanced climate change. Likewise, situations of having to cope with hazards and other interruptions will be a growing phenomenon. Thus, for people in the low-income segment in PNG, vulnerability to climate change is a considerably more poignant issue. In high-income societies – as well as increasingly in middle-income countries – the majority of people can be assured that in times of crisis, such as unemployment, health issues or exposure to natural hazards, they will be able to draw on those social insurance schemes designed to act as temporary bridging measures. In the absence of such schemes, low-income communities in PNG have to deal

with the double burden of facing both economic risks as well as the increasing risks associated with climate change. While those with higher incomes are not affected by the absence of such schemes due to the fact that they can draw on their own resources, the weakness of social safety in PNG places poor people in a state of increased vulnerability.

On the basis of the arguments advanced by Rothstein and Uslaner (2005), the absence of social security measures can be linked to income inequality. The views of those who would benefit the most from such social programs are not represented in the political system because society is stratified to such a degree that it discourages social engagement. In turn, the absence of state services prevents identification with the state. Hence, one could refer to a vicious circle in this regard, where income inequality can be self-perpetuating. Inequality breeds an elitism based on economic influence, which then fails to provide the most vulnerable with the services they require in order to cope with the short-term and long-term implications of climate change. Thus, when the occurrence of natural hazards leads to health implications, there are no formal arrangements to deal with such problems in order to maintain resilience.

In PNG, this factor is compounded by the prevalence of heterogeneous interest groups. Fukuyama (2006) stresses that in PNG, much of the country operates outside of the state. This means that the institutional requirements for effective governance are missing. Instead, political performance is measured by how many resources can be redistributed to one's interest group. In a highly stratified society, this prevents the process of distributing resources where they are most needed.

The institutional problems in PNG are underscored by its persistently high score on corruption indices; in Transparency International's Corruption Perceptions Index, PNG is ranked 144<sup>th</sup> out of 177 countries (Corruption Perceptions, 2013). Yong-Sung and Khagram (2005) argue that there is a link between highly unequal societies and the level of corruption. Moreover, corruption essentially represents a transfer from the poor to the rich (Tanzi, 1998). Thus, when food shortages occur or when people are exposed to natural hazards, the combined effects of inequality and political favoritism render the most vulnerable in a precarious, insecure state. It should be noted that, in parts

of the country, the system of political patronage has broken down (Allen and Hasnain, 2010). Perhaps, this can be explained by a movement towards an electoral system based on alternative voting, encouraging more cohesiveness (Reilly, 2007).

### **Informal Social Security Systems**

While a formal social safety net essentially does not exist in PNG, like in other Pacific island states, informal traditional social security measures are widespread. Not entirely surprisingly in a country as geographically and culturally heterogeneous as PNG, family and community play a much more significant role than the state apparatus. Wood and Gough refer to informal social protection as ‘institutional arrangements where people rely upon community and family relationships to meet their security needs’ (2006: 1699). Hence, there are a plethora of measures which could be subsumed under the heading of informal social security, ranging from cash-based and in kind support to the provision of services. Therefore, the lack of formal social security needs to be looked at with this in mind.

In PNG, one widely practiced traditional security arrangement is the wantok system. Given that society is, to a large extent, based on group membership, this is a system of collective reciprocity in which people of a shared kinship and history provide support to each other in the community (Monsell-Davis, 1993). Crucially within the context of PNG, this is often based on language. However, these support mechanisms not only act as social safety nets, but are also vital in terms of ensuring continuity and creating and sustaining relationships. Moreover, they can often represent the societal organization into hierarchical social structures. Given the prevalence of this form of communal provision of social services and social security, it is not surprising that state-provided measures are underdeveloped.

Informal social security brings with it both advantages and disadvantages. Due to its communal, traditional structure, informal social protection represents a more legitimate way to ensure that the poorest are not left behind. It emphasizes values of community and reciprocity, and therefore creates the basis for solidarity, which is especially important in times of crises. Moreover, support is usually

available quicker, since there are few administrative barriers along the way. Given that the wantok system is culturally ingrained, awareness as well as acceptance is high, constituting an advantage over formal social security which often requires access to information and knowledge about how to qualify for it. Significantly for PNG, it is also disconnected from the formal labor market. Hence, informal measures may be better able to reach those most in need, which in many cases are precisely those who are not members of the official labor force. This is why Hau'ofa (1994: 156) emphasizes that the specific ideas of kinship and reciprocity bind communities together, and should therefore be looked at as an element of adaptive capacity.

However, there are downsides to the system. As Monsell-Davis (1993) points out, it can disincentivize work. Optimal formal social security measures are usually designed in a way to minimize disincentives. Yet, because of the wider societal functions the wantok system assumes, this is often not the case. Moreover, assistance covers a wide range of issues transcending the usual understanding of what a social security system should entail. Payments for marriage functions and other ceremonies as well as contributions to church funds can all be included under the welfare provisions of the wantok system (Mohanty, 2011). Significantly in the case of PNG, the system also entrenches the traditional clan system, encouraging corruption at the political level and making centralized government difficult to achieve.

Hence, in PNG's social system one finds contradictory characteristics with regard to its implications for inequality. On the one hand, it can alleviate inequality by providing less well-off people with financial and other assistance. On the other hand, it entrenches a social hierarchy that is based to a very large extent on traditionally developed conceptions of assistance for certain purposes. If PNG did not have an extraordinarily unequal society, these contradictions would not have the same impact. However, this is the case, and the combination of socioeconomic inequality with this described overreliance on informal structures of reciprocity poses a significant problem.

For one, Mohanty (2011) highlights that the system has already come under pressure. The essence of the problem is that it is not fundamentally a progressive system in the sense that social responsibility

comes with increased wealth and income. Rather, it is more broadly based on status and cultural imperatives to give for certain purposes. Hence, it can create pressure to give where the capacity to do so has already been exceeded. Secondly, the processes of globalization will, in time, likely erode the wantok system. With individualization as well as urbanization, communal ties can break down and therefore undermine the basis on which reciprocity functions.

The erosion of traditional support systems is especially important because their existence has often masked the real extent of poverty in the Pacific region. As Connell (2011) highlights, discourse in the Pacific has not focused on poverty because the traditional support system was assumed to emaciate poverty levels. Connell points out that ‘it is no longer possible [...] for urban people simply to return and be supported by rural kin, while urban households are increasingly reluctant to host impecunious and unproductive rural kin’ (2011: 126). Yet, the assumption that such systems still exist and retain their strength even in the fact of globalization and inequality makes the implementation of other measures more unlikely.

Thus, globalization has contributed to a breakdown of traditional social relationships. In itself, this would not constitute a big problem if formal security had been introduced as a substitute. However, as has been demonstrated, this has not been happening in the context of PNG. Hence, through this mechanism globalization can negatively affect people’s vulnerability to climate change. As informal systems are increasingly unreliable and formal support unavailable, inequality is elevated as a decisive factor governing climate change vulnerability.

### **Conclusion: Papua New Guinea**

The case study of Papua New Guinea reveals how inequality, vulnerability to climate change and globalization are interrelated. Clearly, not everyone is equally vulnerable to climate change. However, beyond this truism there are a number of issues which indicate how inequality and globalization shape vulnerability. For one, globalization and inequality are linked in economic terms. In the context of PNG, this is manifested most clearly in the country’s overreliance on resource exports, and

consequently on global market prices for these products. In the absence of effective centralized governance structures, resource extraction facilitates income inequality because it overwhelmingly rewards those who control the extraction process. Moreover, it does not create a significant number of jobs. Further exacerbating inequality, resource endowments can stimulate corruption.

The absence of formal social security in PNG as well as the shortcomings of traditional safety nets in the face of climate change exacerbate the effects of inequality. Thus, globalization may contribute towards the erosion of traditional support mechanisms, while state-led provisions remain underdeveloped. The combination of these two factors renders certain segments of the population vulnerable in a polarized society. Therefore, globalization is related to climate change and inequality through the mediation of particular social processes which may increase social vulnerability.

Since adverse impacts are skewed towards poorer segments of the population, the socioeconomic consequences of such risk situations could further polarize the income distribution. This is what Van de Werfhorst and Salverda (2012) refer to as reverse causality. Thus, inequality is self-perpetuating because it puts poor people at a disadvantage vis-à-vis climate change. More inequality begets vulnerability, and vice versa. What makes these phenomena especially potent in the context of Papua New Guinea is the combination of insufficiently centralized government, weak institutions and the absence of formal social security arrangements.

## **Case Study 2: Tonga**

### **Society, Economy and the Environment in Tonga**

In many ways, Tonga could not be more different from Papua New Guinea. A very small island state, Tonga consists of a 169 islands considered to form part of the Polynesian region of the South Pacific. However, only 36 of those are inhabited. Tonga, by contrast to PNG, is a constitutional monarchy, and importantly has never completely lost its sovereignty to colonial powers. Moreover, the country is

ethnically homogenous, with more than 96 percent of the population ethnically Tongan (Central Intelligence Agency, 11 March 2014). Hence, ethnic divisions along the lines seen in PNG do not exist in Tonga, while national cohesion is, to some extent, facilitated by the presence of the monarch. Therefore, the political and social environment in Tonga is quite different from PNG.

It is important to recognize that, in terms of exposure to climate change-related risks, Tonga faces enormous challenges. It is one of the 20 countries with the highest average annual disaster losses scaled by gross domestic product (World Bank, 2013). Given that the incidence of such events is likely to increase with climate change, this puts Tonga at great risk. Moreover, since Tonga is an island state, many of the settlements are located along the coast, where the consequences of storms as well as the risks entailed by sea-level rise are greatest. Hence, this forms part of the reason why Tonga ranked second on the World Risk Index in 2012 in terms of climate change exposure (Alliance Development Works, 2012: 19). From an ecological perspective, it could therefore be argued that Tonga faces much greater risks in environmental terms than is the case in PNG, which ranks considerably lower on the exposure scale.

However, Tonga has managed to invest resources into its people. Tonga is ranked 95<sup>th</sup> by the United Nations using the Human Development Index (HDI) framework (UNDP, 2013: 145). Moreover, when discounting income, Tonga's HDI score grows substantially, indicating high life expectancy as well as good education levels. According to the World Bank, Tonga had a per capita gross national income of \$5,020 in 2012. Hence, Tonga is considerably richer than PNG on average terms, despite the small size of its territory as well as its island status.

As is the case with PNG, reliable figures on the extent of income inequality in Tonga are difficult to establish. According to some estimates, Tonga's Gini coefficient was 0.42 in 2001, with the top ten percent of households receiving more than 30 percent of national income compared to only 1.6 percent received by the bottom ten percent (Kingdom of Tonga, 2006). Due to Tonga's small size and its dependence on remittances, the country suffered enormously from the global economic downturn beginning in 2009. This is assumed to have pushed more people into poverty (Fifita, 2011: 7).

However, Tonga does not face the same problems with regard to severe poverty and economic inequality that PNG does.

### **Food Security and Import Dependency**

Tonga is extraordinarily dependent on food imports. In 2011, food accounted for almost one third of all merchandise imports coming to Tonga (World Bank, 2014). Evans and colleagues (2001) suggest that an increasing reliance on imported food has resulted partly from the effects of globalization on Tonga. Globalization has changed food preferences, while also providing many Tongans with cheap alternatives to substitute for some of the traditional staples, which can be relatively expensive due to Tonga's high labor costs. Moreover, Tonga's small size and isolation also play a part in its dependency on imports. Miskelly and colleagues (2011: 7) emphasize that Tonga is especially vulnerable to food price rises due to its high exposure to natural disasters. In fact, Tonga in particular has been experiencing food price spikes in line with global increases after the financial crisis of 2008 (Tonga Preliminary Conclusions, 28 March 2011). In this context, climate change is likely to further increase food import dependency, as recent events in Tonga have demonstrated that the possible increase in climate-related hazards puts local food production under duress (Cyclone-hit Islands, 14 January 2014).

Thus, in a sense Tonga faces a dilemma. On the one hand, it is integrated into the world market to a considerable extent. Due to its nature as an island economy, the country relies on the importation of many goods. In addition to food, Tonga relies especially heavily on imported fuel (Fifita, 2011: 8). Since it cannot produce these goods domestically, it makes sense for Tonga to rely on imported goods. In order to do this at a minimal cost, trade has to be liberalized. However, the fact that Tonga has relatively high labor costs, coupled with the infrastructure costs associated with exporting goods, means that the country faces trade imbalances. In 2009, imports exceeded exports by almost 150 million dollars (World Bank, 2014). Due to the fluctuations in precisely those goods which Tonga depends on, food and fuel, people with lower incomes are hurt much more significantly. Considerably more of their expenses go towards these goods in relative terms. Given the global implications of

climate change, both food as well as energy prices could increase (Hanjra and Qureshi, 2010). As a result, climate change could further exacerbate inequality in Tonga by increasing the financial burden on people with lower incomes.

In particular, Tongan farmers might face what O'Brien and Leichenko refer to as 'double exposure' (2000: 222). They are ill-equipped to deal with both the likely impacts of climate change as well as having to compete with imports. Therefore, farmers in Tonga may be pressured by the double forces of climate change and inequality to migrate either regionally or internationally. Depending on the extent of such migratory streams, this may create new challenges in the sense that it would entail social transformations which have to be dealt with appropriately.

### **The Role of Remittances: Labor Mobility and Resilience**

Similar to PNG's dependency on resource exports, Tonga has long been relying on the remittances sent back home by its expatriates in other countries. In fact, Tonga receives the largest remittance share in the region when measured as a percentage of GDP, with remittances equal to approximately 40 percent of GDP in 2007 (Browne and Mineshima, 2007). Thus, an analysis of how remittances factor into the debate about inequality and climate change is crucial, given the level of importance it assumes within Tongan society and its economy. Fundamentally, remittances are related to globalization in the sense that it allows for greater mobility, lowering transport costs and facilitating the adoption of common standards and practices in a number of policy areas. Therefore, remittances represent an important example of how globalization can increase or decrease a country's vulnerability to climate change.

In general, most analyses indicate that remittances have a positive effect on poverty alleviation (Brown, 2009, Edward et al., 2005). Due to the much higher wages migrant workers can earn in other countries, the value of the money they send back home is significant. This considerably increases the purchasing power of many families. However, the findings on remittances' impacts on income inequality are mixed. While Adams (1991) and Rodriguez (1998) find that remittances have an

inequality-increasing effect, more recent scholarship sees remittances as having an inequality-decreasing effect (Ratha, 2005: 30-32; Lokshin et al., 2007). Refining the issue further, Ebeke and Le Goff (2009) argue that the precise effect of remittances on income inequality depends on the characteristics of the country of origin. With regard to Tonga, Ahlburg (1996) has demonstrated that remittances decrease income inequality.

Tonga is a unique case from the perspective of remittances. One would expect inequality to rise with increased remittances. Since it is primarily more wealthy families who can afford to bear the initial costs of emigration and undertake an investment to benefit them in the future, remittances should widen the income gap. Thus, the advantage of having financial resources acts as an enabler to acquire further economic gain. However, economically motivated emigration in Tonga is already widespread. Brown (2008: 8) notes that in 2004 almost 91 percent of Tongan household received remittances from abroad. For Tongans, emigration is comparatively easier than is the case in many other countries in the Pacific region. Education levels are high, and a number of formal partnership agreements exist, in particular with New Zealand. This reduces the initial costs associated with emigration. Through these mechanisms, remittances play an important role in the Tongan economy, reducing both poverty levels as well as the rate of inequality. Brown concludes that 'remittances constitute an effective, informal, family-based system of social protection for their families in times of financial hardship' (2008: 17).

Hence, remittances decrease Tongan families' vulnerability to climate change by enhancing income to a significant degree. Due to the fact that remittances are tremendously widespread in Tonga, the conjecture that only the richer families benefit from them does not hold. Therefore, remittances can have the effect of easing income inequality. Remittances thus have a double effect. From a neo-material perspective of income inequality, they help to provide poorer families with more resources. This helps them to make the investments needed to adapt to a changing climate. Due to the evidence pointing to an inequality-decreasing effect, remittances can also be analyzed from a psychosocial perspective. By leveling the playing field to a certain extent, remittances can empower otherwise poorer families to become engaged in politics or civic activities. Moreover, Acevedo and Cabrera (2012) have found that remittances strengthen solidarity within families, acting as a private social

safety net. Thus, remittances are not only beneficial from a financial perspective, but also in the sense that they add to the overall feeling of security in Tonga.

However, there is also a downside to Tonga's dependence on remittances. Since remittances are based on emigration, Tonga loses many of its most skilled people to other countries. This could lead to an overall decrease in the quality of Tonga's governance. This brain drain may erode Tonga's capacity to initiate and implement innovative public policies, while also hurting Tonga's economy domestically. Moreover, remittance flows can be highly volatile. As Fifita (2011: 7) highlights, the real value of remittances received by Tongan families declined by 50 percent between 2001 and 2011, with a particularly sharp decline of 20 percent from 2008 to 2009. Therefore, the share of remittances in the Tongan economy has fallen to below one quarter of GDP (Pacific Islands Forum Secretariat, 2012: 14). This can put many families overdependent on the flow of these remittances at risk. Not only is Tonga subject to its own economic cycle of boom and bust, but is also enormously susceptible to recessions in other countries, particularly in New Zealand and Australia. Hence, the volatility of remittances can present a risk to some Tongan families in the sense that they may not receive enough remittances precisely at a time when they are required.

Thus, remittances have positive as well as negative consequences for climate change vulnerability. They provide Tongan families and the Tongan state with additional financial resources, which add to resilience. On the other hand, they can display volatility, which would decrease resilience. However, they likely have a positive overall balance due to their inequality-decreasing function and contribution to poverty alleviation. Hence, from a neo-material perspective, remittances help to close the income gap in terms of access to material resources. Low-income segments of the Tongan population rely on remittances to augment their purchasing power. From a psychosocial point of view, remittances create greater social security by fostering trust between recipients and emigrants. Since remittances are widely dispersed in society, this can build social capital.

## **Urbanization, Inequality and Climate Change**

It has been well-established that socioeconomically disadvantaged communities in precarious environments are particularly vulnerable to the effects of climate change. A study conducted by Grineski and colleagues (2012) finds that lower social class is associated with increased exposure to environmental hazards. Gallopin (2006) stresses that settlements of the poor are often more exposed and sensitive to hazards and display less adaptive capacity in structural terms. In urban areas, this means occupying illegal settlements or living in squatter settlements, as well as having to live in low quality housing with limited space. In rural areas, it means not having land, and therefore facing food and income insecurity. Tongan cities have seen a growth of squatter settlements, as migrants from rural areas move to the limited number of cities in hopes of finding employment. As the Asian Development Bank notes, 'Tonga is a traditional society in transition' (2004: 2). While not as urbanized as other parts of the Pacific, Tonga is still steadily moving away from subsistence-based agriculture and towards a modern monetized economy. This entails particular challenges.

Barnett and Campbell (2010: 39) highlight that climate change and urbanization are interlinked. As agricultural incomes decline due to the adverse effects of a changing climate, more people are moving into cities in order to find alternative employment. Not only does this increase the incidence of urban poverty, but also puts huge pressure on urban services, such as health and transportation. Moreover, urbanization is linked with the growth of inequality. Both Sagala and colleagues (2013) as well as Lu and Gao (2009) suggest that, when urbanization rates are initially low, an increase in urbanization entails growth in income inequality. Connell demonstrates the concrete implications of this process, noting that in the context of cities in the South Pacific, there is 'increasing separation of the elite from the poor' (2011: 128).

Significantly in the case of Tonga, kinship plays an essential role as a coping mechanism. Smit and Wandel stress that 'a strong kinship network may play an important role in a subsistence-based society [in determining adaptive capacity]' (2006: 288). When asked who is most important to help them cope in times of crisis, most people consistently name their immediate family as well as other

close community members (Asian Development Bank, 2004: 15). Yet, urbanization represents a challenge to the adaptive capacity that is generated by such coping mechanisms.

The process of urbanization does not only interrupt traditional coping mechanisms such as kinship networks, but also creates new unique challenges because of its nature. Since urban settlements in Tonga are located on the coast, they are naturally exposed to the consequences of climate change. Moreover, because of inequality in the urban environment, many of those settlements are extraordinarily sensitive to climate change because they may be built using inadequate material, are in need of refurbishment or are not connected to essential services such as running water and waste disposal. Since a substantial majority of migrants build their own accommodation outside of the framework of formal regulations, most settlements are not only vulnerable in an individual sense, but also in terms of being insufficiently connected to public infrastructure. This problem is enhanced when natural hazards occur, as destruction of these properties is more likely and health risks increase.

In Tonga, land ownership is a particular problem connected with the issue of vulnerable informal settlements. Rather than being subject to supply and demand, Tongan males are entitled to a specific allotment of land. Salomon highlights that ‘Article 104 of the Constitution allows only nobles, titular chiefs or matapules (leaders of lower rank) to own hereditary estates’ (2009: 372). This arrangement dates back to the late 19<sup>th</sup> Century. Yet, with population growth, demand for land has outstripped the actual supply. Not only does Tonga’s land ownership law exclude women from the possibility of land ownership, but also creates problems as urbanization is likely to grow. Barnett and Campbell stress that, given uncertain land tenure, ‘households and public authorities are reluctant to invest in areas liable to be reclaimed by customary owners’ (2010: 39). However, precisely this would be necessary in order to strengthen adaptive capacity and reduce climate change vulnerability. Urban planning is ineffective because the institutional arrangements governing land ownership militate against efforts to improve living conditions in the cities.

While it provides a formal land title to every qualifying Tongan male, effectively Tonga’s land system institutionalizes inequality (Kennedy, 2012). Due to the limited amount of land available in island

economies such as Tonga, land is essential. Connell underlines that '[a]ccess to land is zealously guarded, as a crucial, unique and enduring source of wealth' (2011: 129). In most cases, it is generally the low-income segments of the population who miss out on land allocation, while those with more economic resources can facilitate arrangements to buy or lease land more easily in return for financial compensation. As a result, those who cannot afford to buy their way out of the system are forced into illegal settlements which render them insecure not only in economic terms, but also in the face of climate change. Hence, land ownership and the character of urbanization are connected, because uncertain land tenure contributes to the growth of informal settlements. Moreover, this facilitated growth of informal housing exacerbates inequality, particularly when taking into account the future effects of climate change. Since the settlements lack insurance, people are at risk of losing their homes due to storms and other natural hazards as well as inundation. This can have the effect of sustaining poverty or pushing people into poverty as a result of insecure housing in urban areas.

Connell (2011) attributes inadequate urban housing to the inability of the state to provide people with low incomes with public options. Thus, even though the authorities may recognize that urbanization is happening, they do not feel the responsibility to increase urban management capacities in order to ensure that vulnerable segments of the population are protected. Hence, Connell concludes that '[t]he state has virtually abdicated responsibility within the housing arena' (2011: 130). This disadvantages poor people disproportionately, as those with higher incomes in Tonga have a greater capacity to overcome the country's traditional land ownership arrangements.

Hence, uncontrolled and unplanned urbanization will facilitate climate change vulnerability. As agricultural incomes are likely to decline with more extreme weather events as well as soaring temperatures and sea-level rise in the long-term, more and more people are likely to move to cities in order to find employment. This has two implications for climate change vulnerability. Since urban planning in Tonga is underdeveloped, informal settlements will be the only option for many people from poorer backgrounds. Due to Tonga's land ownership laws, a substantial number of Tongans now find themselves without formal titles to land, and are thus forced into vulnerable informal settings. Crucially with regard to climate change, they are disconnected from public infrastructure, which

represents a problem especially when facing natural hazards. This can ultimately create an environment of effective segregation in economic terms, further eroding solidarity among urban dwellers of different socioeconomic backgrounds. Secondly, urbanization will further erode Tonga's traditional support system. Kinship networks can be considered as vitally important as a coping mechanism during times of crisis. Yet, individualization and the possible acceleration of rural-urban migration are likely to undermine traditional structures.

Urbanization is not a negative factor in all circumstances. Indeed, as Garschagen and Romero-Lankao (2013) stress, urbanization can create positive conditions especially for disaster risk management. Moreover, Skoufias and colleagues (2011: 7) underline that labor mobility within countries decreases climate change vulnerability. However, the particular challenges it entails expose areas of weakness within the Tongan institutional framework. Especially given that urbanization rates remain comparatively low at present, further growth of urban areas are likely to put pressure on urban residents' ability to increase resilience.

### **Conclusion: Tonga**

The study of Tonga has highlighted three structural features shaping climate change vulnerability in Tonga. For one Tonga's island economy has become reliant on food imports, which makes it susceptible to price volatilities on a globalized market. Farmers subject to double exposure by globalization and climate change could be especially affected by this issue. Secondly, while remittances may add to vulnerability by facilitating emigration and increasing volatility, they augment Tongans' income and decrease levels of inequality. Therefore, mobility, aided by globalization, increases resilience. Lastly, urbanization entails increased vulnerability in the absence of effective planning. Since urbanization levels in Tonga remain relatively low, increased rates of urbanization may lead to increased inequality and polarization among urban dwellers. This issue is connected to the institutional constraints of Tonga's land law, which underlies the expansion of informal settlements and thereby boosts the development of vulnerable environments.

## **Conclusion**

This study has aimed to demonstrate the linkages between climate change vulnerability and income inequality. Both in Papua New Guinea as well as in Tonga, inequality facilitates vulnerability among particular groups of society. Due to polarization, the lowest socioeconomic strata in society are deprived of resources to access in order to respond to the challenges of climate change and to develop adaptive capacity. Moreover, inequality facilitates institutional arrangements which militate against adaptation to climate change, in particular in the areas of social security and the management of increasing urbanization.

Insofar as globalization acts as a trigger of both phenomena, climate change and inequality are mediated by this process. It is important to note that globalization as such is not necessarily a negative influence in all aspects. Rather, one needs to be aware that the particular consequences implied by globalization need to be responded to with regard to climate change vulnerability. Both the erosion of traditional social support systems as well as ongoing and increasing trends of urbanization produce particular challenges for certain segments of the population. These processes are fundamentally underwritten by inequality in the sense that it produces the circumstances under which the loss of support systems as well as urbanization have detrimental effects on climate change vulnerability. If there was a reasonably equal distribution of resources, traditional support systems would not be needed to the extent that they have been relied upon in the past. Similarly, urbanization would not entail the type of segregation which puts some parts of the population at significant risk vis-à-vis climate change due to their precarious living situation.

Moreover, this study has emphasized that, while the economic dimension of inequality is certainly very important, the social implications should not be dismissed. Political representation and social trust matter as important factors shaping adaptive capacity. They matter particularly in the sense that, as both Papua New Guinea as well as Tonga are societies in transition, they are needed to foster long-term national strategies to adapt to a changing climate. While certain measures can be taken to facilitate individual adaptation, other measures, such as infrastructure and social safety nets, will need

to be implemented at a collective level. If inequality remains high, such measures will be significantly more difficult to realize.

An essential element of analyzing the social causes of climate change vulnerability as well as the possible social implications of climate change outcomes is that, in the face of some degree of climate change that will happen, adaptation will need to be facilitated irrespective of any future mitigation of greenhouse gas emissions. Climate change will happen, and to a limited extent is already happening. There is no absolute certainty how it will happen and what the specific consequences may be. Nevertheless, uncertainty about climate change should not be taken as an impediment to meaningful action. As stressed by Barnett (2001), there is considerable scope to mainstream climate change policies in the Pacific region. Therefore, what needs to be contemplated are policies which address those factors which reduce climate change vulnerability on the one hand, but are also good public policy in a general sense. Poverty is one area which has drawn a lot of attention in this regard. However, inequality is another policy area which could yield significant benefits in terms of reducing vulnerability. By ensuring that more people share in economic growth, solidarity and political participation will be strengthened, thus contributing to more resilient societies. As noted by Parry and Carter, 'the effects of any climate change in the future will be influenced by concurrent economic and social conditions and the extent to which these create a resiliency or vulnerability to impact from climate change' (1998: 24).

Therefore, so-called no-regrets policies are essential in order to deal with the particular challenges entailed by globalization vis-à-vis climate change vulnerability. Not only should there be policies specifically targeted towards climate change, but also policies which help to foster resilience within society in a general sense. The capacity thus built can then be drawn on to deal with the double challenge of climate change and globalization. The point of this study is not to say that globalization is intrinsically bad for societies trying to deal with the consequences of climate change. Rather, the aim is to recognize that there are specific problems associated with globalization's relationship with climate change vulnerability. These problems have to be addressed if resilience is to be strengthened.

Thus, sensible policies could include investing more resources in formal social security as well as implementing urban planning policies.

One of the limitations of this study is that most studies of income inequality are based on empirical findings in Western developed countries, in particular the United States and European countries. Thus, these studies could have a bias and therefore limit the applicability of the findings in other contexts. Moreover, psychological factors have been underexplored. Grothmann and Patt (2005) have emphasized the socio-cognitive elements of climate change vulnerability, such as risk perception and perceived adaptive capacity. Establishing how these factors are related to inequality could add to the overall understanding of climate change vulnerability.

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