Three linked risks for development in the Pacific Islands: Climate Change, Disasters and Conflict

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ABSTRACT

Pacific Island countries are demonstrably vulnerable to the risks of climate change , disasters and conflict. This paper outlines the conceptual links between these risks, briefly describes how each of the risks operates in the Pacific Islands , and goes on to demonstrate the interaction of climate change, disasters and potential for conflict in the Pacific Islands, by applying a new conceptual framework to some illustrative case studies.

The case studies include relocation after the Gizo earthquake, 'environmental refugees' from sea level rise, aggravation of the social issues of urbanisation and unemployed youth by climate change. Fortunately, none of these cases has yet crossed the threshold into violent conflict, even though relocation of an affected community onto someone else's land is a particularly sensitive issue in the Pacific Islands.

1. INTRODUCTION

Climate change, natural hazards and conflict are all risks that threaten to impede social and economic development, wherever they occur, but especially in developing countries, which often lack the economic and human resources to recover quickly from the problems when they occur.

This paper focuses on the *interaction* between these three risks to development, first in general terms and then in the particular context of the Pacific Islands.   Some of the small island states of the Pacific have suffered from conflict in the last couple of decades, and all of them are among the countries acknowledged as most vulnerable to climate change and the associated natural hazards. The case studies in this paper suggest that climate change is likely to raise the level of stress in Pacific communities, particularly in relation to land rights, which are a notorious root of conflict in the Pacific Islands. However , like Barnett (2009), we conclude climate change is unlikely to be a *primary* cause of conflict in the Pacific, at least for the next few years. However, further research on other case studies may be warranted, especially in relation to the longer term (say, 30-50 years) in which impacts of climate change become more severe, not least as the very survival of low-lying atoll states may be at stake.

Before focusing on their interaction, we very briefly consider the risks to development generally posed by the three risks separately (Section 2) . Section 3 then presents a conceptual diagram which summarises the links and interaction between the three risks. Section 4 outlines the context of the Pacific Islands, including more specific detail about the three risks as they apply in that region.   Section 5 introduces a new conceptual framework for examining how climate change and associated disasters can lead to conflict, and applies the framework to several case studies in the Pacific Islands.

2. THREE SEPARATE RISKS TO DEVELOPMENT

Disasters. In a small developing country, the economic cost of a major disaster, such as the earthquake in Haiti in 2010 or the hurricane in Grenada in 2004,   can approach or even exceed the GDP of the country concerned (Cavallo *et al.*, 2010; IPCC, 2007a).   And the computed economic cost may not include the full social cost of loss of life, livelihood, shelter, and food usually associated with such disasters (IFRC, 2002; McKenzie *et al.*, 2005) .   Policy makers, scientists, and development workers around the world have become increasingly aware of the implications of poor disaster management and response planning, and the cost-effectiveness of improving these before the next disaster strikes (Bettencourt *et al.*, 2006) (World Bank, 2010).

Climate change. The UN Human Development Report for 2007/8 asserts that "failure to respond to the challenge [of climate change] will stall and then reverse international efforts to reduce poverty" (UNDP, 2008). The Fourth Assessment Report of the Inter-Governmental Panel on Climate Change (IPCC) offers the most definitive assessment to date on the causes, trends and projected impacts of climate change. The report indicates that climate change cannot easily be disentangled from

other factors which erode development gains and cause upheaval among human populations: "Vulnerable regions face multiple stresses that affect their exposure and sensitivity as well as their capacity to adapt, these stresses arise from, for example, current climate hazards, poverty and unequal access to resources, food insecurity, trends in economic globalization, conflict and incidence of diseases." (IPCC, 2007a). Economic models (reviewed by Metz et al (2007) and by Stern(2006)) suggest that even for a 2 to 3 degree rise in global mean temperature the cost in lost livelihood would be between 1 and 3 per cent of global GDP, but with the higher costs incurred by developing countries.   Such a rise now looks to be almost certain, given the lack of progress with global mitigation efforts. Stern (2006) estimates that the probability of an average temperature increase of 5 or 6 deg C to be a non-negligible 5% and that such a large climate change would incur a loss of 5 to 10% of global GDP, with the percentage much higher in the poorer and more vulnerable countries.

Conflict . Collier (2007) collects strong evidence to show that conflict, particularly in the form of long-running civil war, can prevent a country from developing economically or even socially – trapping a country in poverty. We argue here that less dramatic and more frequent forms of conflict, such as widespread crime or strong mistrust between different parts of society are also a risk to development, though on a lesser scale. In discussing these less overt forms of conflict, in this paper we talk instead in terms of related concepts, notably 'potential conflict', 'security' or 'human security' (see below).

3. GENERAL INTERACTIONS BETWEEN CLIMATE CHANGE, DISASTERS AND THE POTENTIAL FOR CONFLICT

The three risks of disasters, climate change and conflict interact with each other in numerous ways, which we summarise in the triangle shown in Figure 1. In this section, we discuss these interactions in general terms, with examples from the Pacific Islands discussed in more detail in section 5.

There have been very few previous studies that explicitly examine the linkages of all three sides of the triangle: climate change, disaster events and conflict. [1] . The only one known to us is the Global Environment Change and Human Security Project report for the Norwegian Government, which focuses on the implications for developing countries (O'Brien *et al.*, 2008). This report contains a huge bibliography of academic papers, books and agency reports bearing on each side of the triangle shown in Figure 1.

Climate change and disasters.

Climate change is projected to make some natural hazards more severe, notably cyclones, floods and droughts. Conversely, other natural hazards, notably large volcanic eruptions, by putting large amounts of greenhouse gases and aerosol particles into the atmosphere can dramatically affect the climate globally in both the short and long term. (For example, witness the "years without a summer" following the eruptions of Mt Pinatubo in 1991 and Krakatau in 1883).   (IPCC, 2007b)

We caution that although the conceptual link between disaster risk reduction and climate change adaptation is now widely recognised, the vocabulary, practitioners, and responsible institutions are often still separate, though some convergence is beginning to occur (Schipper, 2009).

Disasters and conflict

The UNDP's 'Reducing Disaster Risk' report (Bureau for Crisis Prevention and Recovery, 2004) analyses the factors that could cause 'complex emergencies'. For example, conflict, especially civil war, can make it very difficult to mobilise recovery from a disaster, as government falls apart and/or bars outside access to the affected region. Conversely major disasters of all kinds force people to relocate away from the affected area, for either a short time (s/t) or for the long term (l/t) . Large-scale migrations throughout history have often involved conflict between the migrants and those to whose land they go.

Climate change and conflict

Conflict can contribute to human-induced climate change in various ways. For example, attempts to deprive an enemy of shelter or food ('scorched earth') by destroying forests or crops can increase greenhouse gas emissions. Increased military activity often implies large-scale fuel use, as warships, aircraft and tanks are deployed. The destruction of oil reserves by fire, such as in Kuwait in 1994, can give a spike in greenhouse gas emissions.

Leading a discussion in the UN Security Council in 2007 on the implications of climate change for international security, the UK Foreign Secretary Margaret Beckett pointed to three significant impacts (Reuters, 2007):
- Unprecedented levels of migration – especially from poor to rich countries - as a result of flooding, disease and famine
- Intensified competition for food, water and energy
- Large-scale global economic disruption.

This discussion was followed by a resolution by the UN General Assembly that calls attention to the threat of climate change to international peace and security (UNGA, 2009). That resolution was driven by concerns of Pacific Island countries and other small island developing states that too many industrialised states are not taking climate change seriously enough to prevent drastic impacts on the islands. It aimed to put climate change into an agenda that developed countries – even the recalcitrant USA – take more seriously, namely international peace and security.

Some think tanks which normally focus on international security or the 'war on terror' have taken up this theme, and have expressed alarm about the security implications of climate change (Campbell *et al.*, 2007; Jasparro and Taylor, 2008; Soderblom, 2008). Dyer (2008) gives graphic presentations of such scenarios for major conflicts arising from the impacts of climate change on the Indian subcontinent, China, and central America.

A more measured report by Smith and Vivekanda (2007) for International Alert (an independent peace-building organization with field offices across the developing

world) looked at social and human consequences of climate change, specifically exploring the risks of conflict and instability – which they memorably label as the 'consequences of consequences'. That paper highlights four key elements of risk: political instability, economic weakness, food insecurity, and large scale migration. Like the many other analyses summarised by O'Brien *et al* (2008 chapter 5) they expect such migration to be forced less by short-term disasters (such as floods) than by the more gradual but equally insidious impacts of climate change such as sea level rise, coastal erosion and long-term drought. The possibility of forced migration due to sea level rise is a major issue for the Pacific Islands, and is considered in more detail in Section 5.

In their overall assessment of the literature to date, O'Brien et al (2008) conclude "the evidence about the links between environmental change and violent conflict is currently inconclusive…There is, however, ample evidence that human insecurities associated with a lack of basic needs such as food, water, and shelter, limit capabilities and freedoms, and thus have negative implications for human development". Taking this into account, much of the more recent literature (e.g.Brauch *et al.*, 2009), discusses climate change less in the context of state security (which refers to the defence of borders) but more in the wider context of 'human security' (which refers to the protection of individuals). *Human security* includes not only political security (freedom from war) and personal security (freedom from physical violence) but also economic security, food security, health security, environmental security, and community[cultural] security (UNDP, 1994).

4. **PACIFIC ISLANDS CONTEXT**

We summarise here the recent impacts in the Pacific Islands of each of climate change, natural hazards and conflict before examining the linkages between them.

Each Pacific Island Country (PIC) has given different emphasis to each risk, depending on its circumstances and history. Thus, in the atoll state of Kiribati, climate change and sea level rise is seen as *the* key issue for national survival and receives high political attention, with President Tong personally convening the multinational Tarawa Climate Conference in October 2010 and taking an active personal role in the treaty negotiations at Copenhagen (2009) and Cancun (2010). (See the website www.climate.gov.ki) . Solomon Islands, on the other hand, lies on the geothermal 'ring of fire' and is prone to a wide range of natural hazards of which climate change is only one. It is also still recovering from a violent period of civil unrest (1998-2002), which ended only with the RAMSI peacekeeping intervention by its regional neighbours (Dinnen, 2008).   In Papua New Guinea (PNG), there are even greater concerns about conflict and human security. In Port Moresby (the capital of PNG) about 50% of households experience some form of armed violence each year (Small Arms Survey, 2005), while inter-tribal conflicts in the PNG highlands cause hundreds of deaths each year (Haley and May, 2007).

The map in *Figure 2* indicates locations. Note that the PICs are all small in land area and population (except for Papua New Guinea), though all have an extensive marine Exclusive Economic Zone; in most cases the label on the map is far bigger than the island(s) to which it refers! PNG has a land area of 462,000 km^2 and a population of nearly 6 million. Each of the others has population of less than 1 million and land area of less than 19,000 km^2. Kiribati, for example, has a land area of only 810 km^2 though it spans some 2000 km of ocean! [2] All except the French territories of New Caledonia and French Polynesia are classified by the UN as developing countries. [3]

Conflict

Large scale protracted violent conflict in the Pacific Islands, unlike in some other regions, is mercifully rare. However, in recent decades some Pacific Island countries have experienced a variety of localised conflict including civil war, tribal conflict, inter-communal violence, political instability, social unrest and in some instances a deterioration of law and order. A good starting point into the extensive literature on conflict in the Pacific is the website of the State Society and Governance Project at the Australian National University , available through www.anu.edu.au . See especially the paper by Spence and Wielders (2006) That project website is complemented by that of the more recent Peacebuilding Compared Project , also available through www.anu.edu.au . Also useful is the wide ranging proceedings of the Canterbury conference (Henderson and Watson, 2005).

In his introductory chapter to that volume, Henderson lists six examples of armed conflicts in the Pacific Islands region since 1980: the ongoing independence struggle in West Papua (the western half of the island of New Guinea) with over 100,000

deaths, ongoing tribal fighting in the PNG highlands (several hundred deaths each year), the independence struggle in New Caledonia in the 1980s (over 50 deaths), civil war in the Bougainville region of Papua New Guinea in the 1990s with over 10,000 deaths (Braithwaite *et al.*, 2010a, chapter 7), and inter-communal violence in Solomon Islands 1999-2002 with about 200 deaths (Dinnen, 2008). The damage and loss of lives during these conflicts may be small by global standards but have a tremendous impact on the stability and development of these small islands, not only because of the deaths but also because of the displacement of tens of thousands of people by threats, abductions and destruction of property (especially in Bougainville and Solomon Islands).

Henderson (2005) also gives a long list of violent 'political' events since 1975 involving fewer deaths, including assassinations in Palau, Samoa and New Caledonia, military and civilian coups in Fiji (Lal *et al.*, 2008), and various riots in Vanuatu and French Polynesia. The later riotous protests in 2006 against unresponsive politicians in Tonga could now be added to his list (Campbell, 2008; Harman, 2008).

Conflict and threats to stability in the Pacific, as in other regions, is rarely caused by a single factor. There are usually long standing underlying causes of conflict, or threats to stability which remain embedded in society which erupt into violence due to certain triggering factors (such as disasters or elections, for example). Such *triggers* are often linked to the manipulation of 'identity' by so-called 'conflict entrepreneurs' who benefit from instability. As Steven Ratuva (2002) puts it in relation to the Fiji coups, "differences in identity [e.g. in terms of ethnicity] do not necessarily cause political conflict, but the way in which these differences are deployed to justify particular demands and interests may do so."

Building on Carleton University's long established framework of 'country indicators for foreign policy' (Anderson, 2004) , ANU's current Peacebuilding Project is examining many conflict situations in the region in terms of their 'structural factors, proximate factors, key triggering incidents, key war-making actors, key peace-making actors', etc (Braithwaite *et al.*, 2010b, chapter 1). However events can act as a trigger for conflict, *only* if there are sufficient threats to stability that interact with one another to create a high level of instability and division in the society. Unless these underlying threats to stability are addressed in the long term, the country may be at risk of violent expressions of conflict on an ongoing basis, at the onset of new and ongoing trigger events.

The Biketawa Declaration adopted by Pacific Leaders at their Forum in 2000 specifically identifies as difficult and sensitive issues underlying causes of tensions and conflict in the region: ethnic tensions, socio-economic disparities, lack of good governance, land disputes and erosion of cultural values' (Pacific Islands Forum, 2000). Follow-up work by the Forum Secretariat and UNDP, aiming to develop a Pacific Islands Framework for Human Security and Conflict Prevention has elaborated slightly on these 'causes of tension', to produce a list of factors that are present across the region and present an increasing threat to stability if not addressed. In this paper, we refer to these as *human security factors*. They are:

- Economic inequality

- Land issues
- Weak governance capacity
- Unemployment and alienated youth
- Migration
- Urbanization
- Inter-group tensions

It is important to recognise that several of these factors are interrelated. For example, perceptions of economic inequality drive urbanisation, which may lead to a build-up of youth who are unemployed and alienated if the hoped-for economic opportunities are not forthcoming.

Many of the states that have avoided extensive violent conflict in recent times are in Polynesia, where the traditional governance systems are still operating in parallel with or underlying the modern governance systems and operate up to a national level, thus providing a mechanism for intra-state dispute resolution. Also these states have much tighter gun controls than has been the case in Papua New Guinea and Solomon Islands, where the ready availability of guns has led to a sharp increase in mortality from inter-tribal conflicts (Haley and May, 2007). Indeed, in those states where there are significant armed forces, their record suggests that militaries and para-militaries have tended to generate instability rather than stability (Crocombe, 2008; Henderson, 2005).

Natural hazards

Pacific Island Countries are amongst the most vulnerable countries in the world to disasters arising from natural hazards, in part because their economies and small communities are highly dependent on natural resources. The World Bank reports that since 1950 disasters have affected more than 3.4 million people in total and caused more than 1,700 fatalities in the Pacific region. (Bettencourt *et al.*, 2006) This represents a significant fraction of the region's population of less than 8 million; over 40 percent of the population of Tonga and Samoa is affected during a typical disaster year.   For comparison, OCHA (2009) estimate that over 20 million people out of a global population of over 6 billion were displaced in 2008 by sudden-onset climate-related disasters. That World Bank report estimated the economic cost of reported disasters in the Pacific Islands region in the 1990s at US$2.8 billion (2004 value). This represents a very significant fraction of the GDP of these small island states. For example, during disaster years, the economic losses have averaged 46 percent of GDP in Samoa, 30% in Vanuatu and 14% in Tonga. As the damage effects normally extend beyond the year of the disaster, so too do the consequent economic losses, which amount to 2–7 percent of GDP, averaged over both disaster and non-disaster years. (Bettencourt *et al.*, 2006)

The most prevalent natural hazards in the region as a whole are cyclones, droughts and tsunamis, but not all Pacific Island countries are equally vulnerable to each of these hazards. There has been a substantial increase in the number of reported disasters in the region since the 1950s, with a growing human impact per event. While this may be due to improved reporting, higher populations and increasing

environmental degradation, there is no doubt that disasters in the region are becoming more intense and probably more frequent (Bettencourt *et al.*, 2006).

Much work has been undertaken in terms of disaster management and risk reduction at both national and regional levels. Nevertheless, we consider that it is still true that the vulnerability of PICs is exacerbated by socio-political factors identified by Bettencourt et al (2006) including: risk management not adequately mainstreamed into national planning and budgetary processes; limited capacity within government and civil society; lack of awareness on the link between development practice and vulnerability disasters; weak institutional frameworks for implementing measures for Disaster Risk Management . Similar socio-political considerations apply to the vulnerability to climate change and to adaptation to that risk (Nunn, 2009).

Impacts of climate change

High exposure to climate risks and limited adaptive capacity make Pacific Island Countries particularly vulnerable to climate change and sea-level rise. The impacts projected by the authoritative Intergovernmental Panel on Climate Change (IPCC, 2007a) include:

- Deterioration in coastal conditions, for example through erosion of beaches and coral bleaching, is expected to affect local resources, e.g., fisheries, and reduce the value of these destinations for tourism.
- Sea-level rise is expected to exacerbate inundation, storm surge, erosion and other coastal hazards, thus threatening vital infrastructure, settlements and facilities that support the livelihood of island communities.
- Climate change is projected by the mid-century to reduce water resources in many small islands, e.g., in the Caribbean and Pacific, to the point where they become insufficient to meet demand during low rainfall periods.

The impacts of sea level rise are already apparent in the low-lying atolls, which comprise most of Kiribati, Tuvalu and Marshall Islands, with many islands now being inundated almost annually by the highest tide of the year. With sea levels projected to rise by at least 100cm by 2100, the very survival of these countries is threatened (see Box 2).

IPCC (2007b) projections imply lower rainfall, more frequent droughts, and less frequent cyclones west of Fiji, with higher rainfall and more frequent cyclones east of Fiji. More generally about cyclones world-wide, IPCC project increased peak wind intensities and increased mean and peak precipitation intensities in future tropical cyclones, with the possibility of a decrease in the number of relatively weak cyclones, and increased numbers of intense cyclones (also known as typhoons or hurricanes) .

The recent book by Barnett and Campbell (2009) highlights the importance of considering climate change impacts in the Pacific from a socio-political perspective and not just as a topic for scientific modelling. This perspective focuses on issues such as forced migration, displacement and dislocation resulting from climate change and disasters, and the subsequent ramifications on social structures and coping capacities.

5. **INTERACTIONS BETWEEN CLIMATE CHANGE , DISASTERS AND
CONFLICT IN THE PACIFIC**

The link from climate change and disaster events to potential for conflict

In Section 4 of this paper we have found that:

- Potential for conflict occurs in a Pacific Island country when one or more of the following human security factors are present: economic inequalities; land issues; weak governance capacity; unemployed and alienated youth; migration/urbanisation; and inter-group tensions.
- Conflict requires a triggering event.
- Climate change is expected to increase the severity of natural hazards in the region, especially tropical cyclones, which make up the most widespread disaster events in the region.

To these we now add the following linkages:
- A sudden-onset disaster [4] can be a triggering event for conflict.
- Longer-term (slow-onset) climate change can also trigger conflict by aggravating existing environmental and societal stresses, notably stresses on water supply and   food security.

These linkages are indicated in Figure 3, which in effect elaborates on the arrows in Figure 1 pointing towards [potential] conflict. Figure 3 provides a new conceptual framework for examining how climate change and associated disasters can lead to conflict. In each case, a disaster event or manifestation of climate change triggers a 'physical' consequence, which in turn aggravates one or more of the human security factors which underpin conflict in the Pacific. If this human security factor is already near its breaking point, then the trigger of the disaster or climate change impact can be enough to take an already tense situation over the threshold into overt conflict.

By way of example, Table 1 summarises some cases in which land rights and other human security factors have been, or can be expected to be, aggravated by climate change and other natural hazards. In the following text we draw out these linkages more explicitly through the case studies listed in the table. These case studies are based on published papers, supplemented by interviews we conducted in Solomon Islands, Kiribati, Fiji, and Papua New Guinea.

Relocation after a disaster - on whose land?

Disputes over land are one of the major causes of tension and conflict in the Pacific Islands. For this reason, the Forum Secretariat commissioned a series of studies focussed specifically on Land Management and Conflict Minimisation, of which McIntyre (2009) is the most directly relevant to this paper.

Crocombe (2008 chapter 11) eloquently describes land rights in the Pacific Islands and their implications. In most PICs, most of the land is still under customary land ownership, either communal or individual The communal land-owning group is typically a village or clan unit. Land, which usually allows a reasonably healthy level

of subsistence farming, constitutes not only the main economic asset for many people, but also a manifestation of the identity of the community to which they belong.   Land-owners often require considerable persuasion to allow 'their' land to be used for any other purpose (Bennett, 2002). As a further complication, in many PICs, there are often disputes about exactly who are the land-owners, especially if the land suddenly becomes valuable to outsiders, e.g. because mineral resources are found under it.   Most of the alienated land (i.e. land held under western-style law) is around the urban centres, where it was acquired in colonial times by colonists and / or the government.

The top row of *Table 1* summarises how a disaster of some kind can impact on the human security factor of *land*: a common consequence of a disaster is that people have to be relocated away from the affected area for a short or long time (depending on the nature of the disaster).   For example, following the 2007 earthquake and associated tsunami in the Solomon Islands people in the worst affected areas were relocated to 'temporary' settlements inshore. They have now been there for over 2 years, which gives rise to tensions with the people onto whose land they have been relocated. (Ironically, most of these displaced are descendants of people who were moved by the British colonial government from some atolls in what is now Kiribati, when those islands became uninhabitable due to salt intrusion in the 1950s, (Lieber, 1977).) Numerous Solomon Islanders consider that the relief effort (and funds donated for it)have been politically mismanaged. This invokes another human security factor likely to lead to conflict (though it has not done so in this case): *weak governance*. Moreover there are perceptions of *economic inequality* arising from the way in which some villages have been favoured by the relief effort – with new buildings stronger than those destroyed - while others have got nothing as yet. Had this disaster occurred during the conflict of 1999-2002, when there was no functional central government, the response would almost certainly have been even less effective – it would have been an example of the reverse arrow of Figure 1, 'inability to respond to disasters'.

This story contrasts with the aftermath of the most recent eruption of the volcano(s) around the town of Rabaul in Papua New Guinea (in 1994) which smothered most of the town in ash. Several thousand people have been permanently relocated to other parts of the Gazelle Peninsula. The relative success of this relocation is partly due to the funds and special administration set up to deal with it, but also because of the recognition implicitly given to conflict avoidance by putting most of the resettlement on 'plantation' land that was alienated a century or so ago. This greatly weakened any claims by native 'land-owners' for compensation (by force or otherwise) for the intrusion. (A Regan, personal communication).

The remaining entry in the second row of Table 1 refers to a village on the island of Savaii in Samoa that was buried by a lava flow in 1908. The whole village was relocated, with assistance from the Catholic Church, to an unoccupied site on the island of Upolu, and recently celebrated the centenary of this event (Samoa Times, 2008). Two probable reasons why that story turned out happily (no conflict) are that (i) inter-group tensions were low in the homogeneous society of Samoa, and (ii) unoccupied land was easier to find in 1908 than it would be now that the population of the country is much higher.

Although the most common type of natural hazard in the Pacific is tropical cyclones, only rarely have these been severe enough to require relocation from the affected area. All Pacific societies had traditional coping mechanisms, usually involving holding back certain long-lasting foodstuffs until they were needed, i.e. the interval between when the usual crops were destroyed and when a fresh crop could be planted and come to fruition.

Forced migration (relocation)

The UN High Commission for Refugees deals only with those who are displaced by war or persecution In 2008 , there were no fewer than 42 million such people, of which 26 million were internally displaced people uprooted within their own countries (UNHCR, 2009) . People displaced for other reasons are not yet legally recognised as 'refugees', but there is increasing international discussion of such cases, exemplified by the electronic journal *Forced Migration Review,* published continuously since 1987. In particular, the issue of 'environmental refugees' driven by climate change is being discussed (Couldrey and Herson, 2008) [5] . The number of people potentially affected world-wide is controversial, but may well be as many as the number of those fleeing conflict (O'Brien *et al.*, 2008).

In the Pacific Islands, a literature survey by Campbell, Goldsmith and Koshy (2005) found 86 reported cases of forced relocation between 1920 and 2005. Of these relocations, just under half (37 cases out of 86) were driven by natural hazards and disasters. (These authors usefully distinguish between 'relocations' of whole communities, 'evacuations' in which the community returns to its original location after temporarily fleeing some disaster, and 'migration' of individuals, even when others from the same community follow over time by a process of chain migration). Most of the other relocations were driven by armed conflict or major projects such as mines, new airports, or nuclear testing. Many of these displacements involve people moving within a country, which in Pacific Island countries often means from one island to another.

 'Environmental refugees' from sea level rise

Climate change is projected to make tropical cyclones more severe, and perhaps also more frequent. (IPCC, 2007b) That dynamic is implied in the 'sudden' disaster linkage to conflict indicated by the left side of the triangle diagram (see *Figure 1*).

But climate change can also give rise to conflict through the gradual and insidious effects represented by the right side of the triangle diagram (Figure 1), notably through sea level rise   and through persistent changes to rainfall and temperature patterns (e.g. longer dry spells and warmer seas).

The 2007 report of the Intergovernmental Panel on Climate Change projects that sea level may rise by 1m by the end of this century, thereby swamping many coral atolls, in which the highest point is less than 2m above mean sea level. But an atoll will become uninhabitable long before it is totally submerged, because salt water incursion will pollute its fresh water supply, which is held underground, in a 'lens' floating on

top of the sea level. Salt water incursion from below is aggravated by extra high tides (king tides) and storm surges, which bring in salt water from above as it washes over the land. This is already happening to many atolls in the Pacific, with the Carteret Islands of PNG being a well-publicised case (see Box 1), and is likely to happen by about 2040 for most of the others.

Several PICs consist almost entirely of atolls, notably Kiribati, Tuvalu and Marshall Islands. All or most of the tens of thousands of inhabitants of these countries will probably have to migrate to other countries either legally or illegally by about 2040. These raises not only the internal human security factors of Table 1 but also the international security concerns flagged in section 2 of this paper (See Box 2).

Some analysts regard such large-scale forced migration as an extreme adaptation to climate change (Nunn, 2009) while others argue it should be classified as an impact on the small islands and compensated accordingly by the countries whose emissions caused the problem (Barnett and Campbell, 2010). Some PIC governments tend to refrain from forcibly raising the issue in the international negotiations about the climate change treaties in order to maintain pressure to decrease global GHG emissions. Other PICs, notably Kiribati, squarely face the issue and try to lessen its impact on both the sending and receiving countries by seeking a much increased legal migration to nearby metropolitan countries, most likely through gradual labour migration as advocated by Barnett and Campbell (2010) (see Box 2).

Box 1. The Carteret Islands: the first environmental refugees?

The Cartaret Islands form a low-lying coral atoll in Papua New Guinea, about 100 km north-east of the large island of Bougainville. Food security has been poor for decades because of the high population density and the limited and relatively infertile land area of an atoll, even if fish are abundant . Consequently governments at various levels have been attempting since the 1980s to relocate at least some of the population to Bougainville (Bourke and Betitis, 2003). However only a few families have ever actually been relocated, and many of these have moved back to their original islands over the years, in part for cultural reasons and (in the 1990s) because of the insecurity on Bougainville alluded to in Section 4.

The food security in the Carterets has been aggravated by salinisation from rising sea levels. Environmental NGOs such as Greenpeace have given much publicity to population movements since about 2000, not least through videos on *YouTube*, and through the islanders own website tulelepeisa.org , claiming that these people are the first 'environmental refugees' from human-induced sea level rise. Some geologists dispute this interpretation, saying that the islands are sinking due to geological instabilities. But in human terms the effect is the same: people have to move because their current habitat is unsustainable .

Box 2: Can a whole country relocate? The case of Kiribati

Kiribati is comprised of 33 inhabited islands, all but one of which are low-lying coral atolls. In a typical atoll, a lagoon of sea water is enclosed by a coral reef, some of which rises above sea level to form a narrow- low-lying strip of land (Nunn, 1994). [6]

Because of salt water intrusion caused by sea level rise, Kiribati and other atoll countries may become largely uninhabitable by 2040 or thereabouts, as they will have no stock of fresh water to drink or to grow crops. In Kiribati this pressure will be particularly severe, because

about 50,000 people (half the total population) now live in the 'capital island' of Tarawa, concentrated in the most habitable side of this relatively large atoll: a strip about 20 km long by 200 meters wide and no more than two meters high. Thus, on this island with little land available for crops and limited fresh water, food security and water supply are already under stress. Climate change and associated sea level rise will worsen these human security issues.

 For such countries, sea level rise is a matter of national survival, and consequently an issue of high political importance. Thus, the President of Kiribati, Mr. Anote Tong, has been vocal in international forums, not least the Conference of Parties of the UN Framework Convention on Climate Change. He points out that the industrialised world (which is responsible for the greenhouse gas emissions which are causing sea level rise) consequently has a moral obligation to facilitate the relocation of the people who will be displaced from Kiribati and similar countries. He also seeks assistance to upgrade the skills of the people of Kiribati, so that they can better adapt to life in another country, even though much of their traditional culture will be lost (which can be seen as a related human rights issue) (Nadkarni, 2008) .

Climate change will aggravate issues of urbanisation and unemployed youth in the Pacific Islands

The population of most Pacific Island countries is both very young (typically >50% under 15 years old) and rapidly increasing (e.g. 2% increase per year in Kiribati, 2.2% in PNG) (SPC, 2009). There is also increasing *urbanisation*, much of it now driven by perceptions of better educational and consequently better economic opportunities in the urban centre. Unfortunately, many of the young people who finish up in the towns of the Pacific are unable to find the hoped-for economic opportunities but are reluctant to 'return' to the rural area or outer island from which they or their family have come, as they feel that to do so would lower their status by an admission of failure. Instead they hang round the towns as a collective of unemployed or alienated youth. This is rated as a potential conflict factor because it can lead to crime as a means for the youth to support themselves, and criminal gangs as a way to assert their identity, as has already happened dramatically in Papua New Guinea.

Box 3 compares the youth situation in PNG with that in Kiribati, where violent conflict is very much rarer. Solomon Islands and Fiji represent intermediate cases between these extremes.

Climate change is likely to aggravate these human security factors, by decreasing food security in the rural areas or outer islands, thereby adding to the factors inducing migration to urban areas where imported food is more readily available. Locke's (2009) interviews in Kiribati suggest that this is already happening there. Alternatively, where people (usually older people) are reluctant to move for cultural reasons, climate change can lead to increased pressure on diminishing resources of food and/or fresh water.

Box 3 . Urban youth in Kiribati and PNG

In Kiribati for example, about 50,000 people (half the total population) now live in the 'capital island' of Tarawa. Because there is so little land there, population densities in parts of Tarawa are comparable to those in Hong Kong.   Since families on other islands often send a child to stay with a relative on Tarawa for secondary education, the population there has an even

greater proportion of youths than the country as a whole. But in a country with a few resources (at least on land) there is little employment outside government and the government-owned service corporations (telecommunications, shipping etc) .

Consequently of the 2000 young people who finish their schooling each year in Kiribati, only about 500 find paid employment within 12 months (Locke, 2009) Nor can they simply go into farming or fishing (the traditional subsistence occupations) as there is no land available for new gardens on crowded South Tarawa, and many do not have access to a boat for fishing (which is also under pressure there).   Fortunately, these underemployed youths on Tarawa have kept themselves occupied with sports and other social activities, and although there have clearly been family tensions, as yet few have turned to crime. Community leaders interviewed in Kiribati attribute this happy state to the strength of the extended family culture in Kiribati, although there are some signs that this is starting to weaken. For example, teenage pregnancy (an excess of social activity?) and prostitution (with visiting seamen) are quite significant. Social workers from government and churches have fostered constructive activities for youth, but no one has yet come up with any long-term solutions.

Given demographic trends over the coming decade, the youth problem is likely to get worse in Kiribati. We think that this will probably entail a rise in petty crime, as youth seek resources to sustain their activities, though the culture will probably continue to restrain major crime.

The problem of unemployed youth is far worse in Papua New Guinea than anywhere else in the Pacific, as many of the unemployed youth in the main town (Port Moresby) have formed into *raskol* gangs and turned to violent crime. In Port Moresby (the capital of PNG) 50% of households have experienced some form of armed violence in the past six months (Small Arms Survey, 2005). In PNG, 85% of the population of 6 million still lives a basically subsistence life in rural areas, and the population of Port Moresby is less than 300,000. Thus the proportion of youth 'hanging round' the town is smaller than in several other PICs, but their involvement in conflict is far greater.

6. CONCLUSIONS

The conceptual framework summarised in Figure 1 and Figure 3 of this paper is a fruitful way to analyse the way in which a particular manifestation of climate change or disaster can increase tension that is already present in a Pacific island. Gradual climate change (and/or associated sea level rise) or a disaster event (a 'triggering event') leads to physical consequences, which in turn may aggravate one of the socio-economic factors that underlie almost all conflict in the Pacific Islands. If so, this will raise tension in the community. Most obviously this occurs when the 'physical consequence' involves relocation of an affected community onto someone else's land, since almost everywhere in the Pacific Islands, a change in land use or land rights is a contentious issue. A range of case studies are presented in this paper, which between them invoke not only land issues, but six other factors which can underlie conflict (weak governance, economic inequality, food/ water insecurity, urbanisation, alienated youth and intergroup tension).   Further research would document many more examples, but the present brief survey clearly demonstrates the principle.

A major factor determining whether such an increase in tension leads to violent conflict depends on how tense the situation was before the triggering event: will the trigger push the tension across a threshold of tolerance?   Alternatively in some

circumstances, the parties involved may perceive the potential damage from climate change as the greater threat, and put aside their differences to work together to alleviate that shared threat.

Are any of the case studies outlined here (or similar events in the next 10 years or so) likely to lead to violent conflict? This requires a deeper analysis than we have been able to do at this stage, but our preliminary opinion is 'no'. Perhaps the demographic time-bomb in Kiribati may lead to an increase in violent crime on Tarawa in the next ten years or so. But sea level rise, though undoubtedly aggravating the underlying social dynamics of Kiribati, is unlikely to be dramatic enough over that short time frame to be a decisive trigger for conflict. Barnett's case studies in Tuvalu and Timor Leste lead him to a similar conclusion (Barnett, 2009). Violence in the past decade in the Solomon Islands, Fiji and Tonga and continuing violence in Papua New Guinea have been primarily driven by social or political factors other than climate change; climate change can only marginally affect those situations.

In the longer term however, unless the more industrialised countries (including China and USA) make a dramatic decrease in their greenhouse gas emissions, sea level rise over the next 30 to 40 years is very likely to render Kiribati and other atoll nations uninhabitable. Relocating some 200,000 people from Pacific Islands will be traumatic for those people, especially if it occurs in a 'last-minute' rush but perhaps less so if larger neighbouring countries accept a gradual stream of emigrants. In that way, conflict and tension in the accepting countries will also be minimised, as the 'climate refugees' would be only a small proportion of the immigration stream which they are currently accepting without much drama.

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Table 1:   Summary of some Pacific examples illustrating how disasters and/or climate change can lead to potential for conflict. In each case, a disaster event or manifestation of climate change triggers a 'physical' consequence, which in turn aggravates one of the socio-economic factors which underpin conflict in the Pacific. Some cases where conflict was successfully avoided are also listed. The fisheries examples are not elaborated in this paper, but are discussed in SPC (2008) and Weir & Virani (2010) .

Trigger	country (case)	Physical consequence	Socio-economic factor(s) aggravated
disaster (earthquake or volcano)	SI (Gizo)	relocation of people affected	Land; governance; economic inequality
disaster (earthquake or volcano)	PNG (Rabaul); Samoa (Savaii)	relocation of people affected	None ! (see text)
sea level rise	Kiribati; PNG (Cartarets)	low-lying atolls become unliveable -> relocation	food/ water insecurity; land
Climate change	Solomon Islands; PNG, Kiribati; Fiji	Decrease in rural food security -> increased migration to towns	economic inequality; alienated youth; urbanisation
Climate change	Solomon Islands; PNG; Kiribati; Fiji	Offshore tuna fishery moves east	economic inequality
Climate change	All PICs	Coastal fisheries likely to decline	Food security; intergroup tension

NOTES

[1] This paper is concerned with disaster events arising from natural hazards. These were called 'natural disasters' in the terms of reference for the consultancy on which this paper is based and in much of the older literature, but that term is now regarded by many as misleading and obsolete, on the grounds that natural hazards become disasters only because of social and institutional factors.

[2] These and other geographical statistics in this paper come from SPC (2009).

[3] The Equator runs through the middle of Figure 2 (near Nauru). Therefore Pacific Islanders regard the terminology of 'North' for developed countries and 'South' for developing countries as geographically misleading and it is almost never used in this region.

[4] The disaster literature often distinguishes 'sudden onset' disasters where the damage occurs in a few days or even a few minutes, as with earthquakes and cyclones, from those like droughts where the damage is cumulative over years.

[5] The term 'refugee' has dubious legal status in this context. However, speaking of 'environmental refugees' makes clear that they are people driven to relocate by clearly visible   environmental stresses, leaving open the vexed question of the degree to which these stresses can be attributed to climate change (Couldrey and Herson, 2008).

[6] The only island in Kiribati which rises more than 3 meters above sea level (Banaba) has no permanent fresh water, and therefore does not offer a viable escape from rising sea levels.

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