

# Building Peace in Bougainville: Measuring Recovery Post-Conflict<sup>1</sup>



Australian  
National  
University

SATISH CHAND

SSGM DISCUSSION PAPER 2013/5

This paper documents the socio-economic status of the Autonomous Region of Bougainville and the extent of rebound in investment and access to services since the cessation of conflict there in 1997. Data on the level of income, the age profile of the population, the level of access to basic services, and levels of investment in residential housing were collected via a household-level survey that was administered in the four major urban centres. Analysis of these data shows that per capita income has rebounded to 40 per cent of the pre-conflict level; approximately half of the population is aged less than 20 years; and one-third of school-age children are not attending school. These observations have value in assessing the extent of economic recovery following the installation of peace and the levels of public investment required for improving access to basic services.

## Introduction

Bougainville has remained peaceful for a dozen years. Peace was negotiated following a decade-long war that is estimated to have caused approximately 2,000 deaths and possibly ten times as many more due to lack of services (Braithwaite et al. 2010). The then province of Papua New Guinea fell from its top rank to the bottom in terms of per capita income and other social indicators of development among the 19 provinces. The impact of the conflict lives on in the form of 'cooked' (burnt) and ruined infrastructure, and a 'lost generation' comprising those who missed out on schooling and basic health care during the conflict. Here I use data collected through a purpose-designed household survey that was administered in February 2011 to show that incomes and access to services are recovering but are yet to reach pre-crisis levels.

Wars cause growth collapses with immense human suffering and this is no less true of civil

conflicts. One estimate shows that intra-state wars have caused three times as many deaths as inter-state wars since World War II (Fearon and Laitin 2003). Furthermore, post-conflict peace has proved to be fragile, with nearly one-half of civil wars due to post-conflict relapses (Collier et al. 2008). Research on the causes of intra-state war and what to do about ending them is in its infancy. Most of the studies draw on cross-country analysis and in the main from sub-Saharan Africa. Such analysis, while informative, misses out on the nuances of the particular context. The lack of detailed micro-empirical analyses including detailed case studies is due to the absence of requisite data (Abadie and Gardeazabal 2003). This paper demonstrates how socio-economic data may be collected in a post-conflict environment and the use such information may be put to.

The economic drivers of conflict and the extent to which a rebound in the economy could help cement peace remains an open question. There is a view that economic factors trump social and institutional characteristics in explaining the incidence of civil conflict, even though the causal factors at work remain in dispute. Economists, for example, explain the robust negative relationship between levels of per capita gross domestic product (GDP) and the onset and duration of conflicts as evidence supporting the proposition that conflicts prevail when the opportunity costs of war are low compared to substitute activities such as farming (Collier and Hoeffler 1998). Miguel et al. (2004) lend evidential support to the proposition that declines in the rate of economic growth cause conflicts, by using rainfall data from sub-Saharan Africa to show that negative exogenous shocks to income increase the likelihood of civil conflict. They estimate that



‘a one per centage point decline in GDP increases the likelihood of civil conflict by over two per centage points’ (ibid:740). Political scientists, while acknowledging the negative correlation between income and conflict, question the causal links: Fearon and Laitin (2003), for example, argue that limited repressive capacities of the state due to low national income explain the observed negative correlation between per capita GDP and conflict. Rationalist explanations that wars prevail when feasible encompass both of the above arguments (Collier et al. 2009).

Cross-country studies, while useful in identifying broad regularities in the data, are insufficient to inform policy formulation in a particular context. This is because the nature of conflicts is likely to be ‘radically different’ in different countries (Abadie and Gardeazabal 2003). The nuances of individual conflicts demand detailed case studies to inform policymaking on the ground, which in turn require micro-economic data. However, reliable timely data at the household level is generally absent in most post-conflict environments. The collection and storage of data is a common casualty in a conflict: both from omission and commission. On the former, resources expended in the collection and storage of data are often withdrawn as fiscal pressures build in the lead-up to war. On the latter, expropriation of property often involves purposeful destruction of records (Braithwaite et al. 2010). Consequently, policymaking in the aftermath of war suffers from lack of information.

In the case of Bougainville, its turbulent past illustrates the disruptive potential of uneven growth — between enclave mining and the rest of the economy. A referendum for independence is due to be held between 2015 and 2020 as agreed to under the peace agreement signed on 30 August 2001 (GoPNG 2001). The past of a vibrant economy built on cocoa, copra and mining was destroyed during the decade-long war with concomitant collapse in socio-economic indicators. The above has lessons for a future Bougainville. Whether as an independent nation or as a peacefully integrated region of Papua New Guinea, broad-based economic recovery and widespread access to basic services and jobs will be critical to sustaining peace

for the foreseeable future. Critical to creating the conditions for broad-based growth and widespread access to services is effective policymaking, for which timely data is a prerequisite. The requisite data is largely absent.

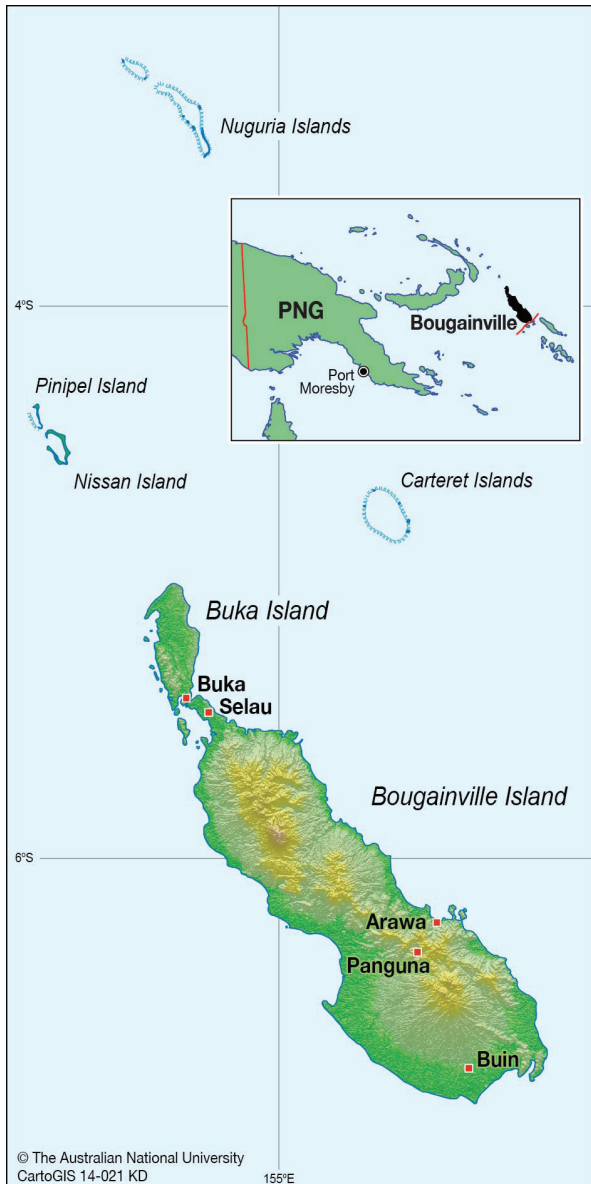
Collecting data in a post-conflict environment is difficult. The major challenges include ensuring the safety of the researchers during fieldwork, maintaining quality of the collected data, and garnering the resources for fieldwork. The case of post-conflict Bougainville is used to demonstrate how data to gauge the extent of economic recovery may be collected and then used to inform policymaking. A household-level survey of four urban centres was used to provide a snapshot of the levels of income, population and access to basic services. Data on levels of schooling and the age (and type) of residences was used to reconstruct a time profile on accessibility to basic services and the conditions for investment during the crisis. This cross-sectional information was combined with data on cocoa exports to create a time profile of income during the conflict.

This paper is structured as follows: the next section provides the context of post-conflict Bougainville; the methodology for data collection is then presented; some preliminary findings are outlined; and the paper concludes with implications for policymaking.

### The Context

Bougainville is a volcanic island with a land area of 8,990 square kilometres (equal to 2 per cent of the total land mass of Papua New Guinea) situated 6 degrees south of the equator and to the east of mainland New Guinea (Figure 1). Until 1998, North Solomons Province comprised the mainland (of Bougainville Island) and the surrounding islands of Buka, Carterets, Nissan, Nuguria, and the outliers Mortlock and Tasman. It was one of the 19 provinces of Papua New Guinea which, together with the National Capital District, comprised the nation state of Papua New Guinea. Bougainville acquired autonomy on domestic policies and policing as part of a peace agreement that was concluded in 2001 following the violent decade-long intra-state war (GoPNG 2001).

**Figure 1: The Autonomous Region of Bougainville**



Source: CartoGIS, The Australian National University

The conflict began with militants delivering a series of explosions from 25 to 27 November 1988. These explosions brought down several power pylons belonging to the Bougainville Copper Limited (BCL) gold and copper mine at Panguna in central Bougainville. BCL was then jointly owned by Conzinc Riotinto of Australia (with equity of 54 per cent), the Papua New Guinea Government (19 per cent) and through public shares (27 per cent) (Thompson 1991). The mine had been in production since April 1972 and to its

closure in May 1989 had accounted for 45 per cent of national exports, 17 per cent of internally generated government revenues, and 12 per cent of GDP (Carruthers 1990). By 1986 BCL was in mid-life with a dozen years of proven recoverable reserves and annual exports of ore concentrate containing 178,600 tons of copper and 16.4 tons of gold (World Bank 1988). It was among the ten largest copper mines on the planet and poised for an investment program from 1988 to 1992 of 520 million kina (at 1988 prices).<sup>2</sup> The mine was classed as a low-cost producer and an 'extremely successful venture' (World Bank 1988 vol. 2:16). BCL suspended operations in the aftermath of the explosions as security deteriorated and was forced to close the mine indefinitely on 15 May 1989 (Thompson 1991). The mine remains closed.

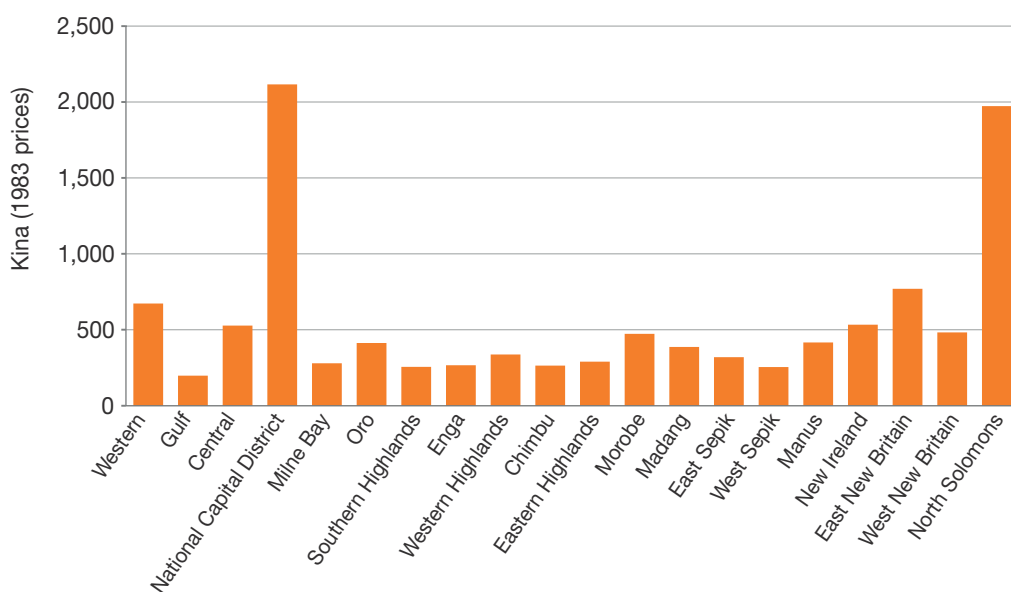
The population of the island at the beginning of the conflict is estimated at 175,900, constituting about five per cent of the then national population of four million (Thompson 1991).<sup>3</sup> Internal migration within Bougainville up until the development of the mine was negligible. Thomson (1991:73), for example, notes that: 'as recently as 1975, 95 per cent of the islanders were living within 10 kilometres of where they were born'. Importantly, pre-conflict Bougainville was a wealthy province with highly favourable socio-economic indicators in comparison to the rest of the nation. In 1983, per capita income at 1,973 kina was the second highest of the 20 provinces of Papua New Guinea (Figure 2); surpassed only by the National Capital District (with per capita income of 2,115 kina) that is home to Port Moresby, the nation's capital (World Bank 1988).<sup>4</sup> Bougainville ranked first among the provinces on life expectancy (59.6 years compared to the national average of 49.6 years), infant mortality (33 deaths per 1,000 live births compared to the national average of 72), and second lowest in terms of the proportion of population without any schooling (50.1 per cent compared to the national average of 78.0 per cent) (World Bank 1988 vol. 1:98). Before its closure, BCL generated 196 megawatts of electricity at its thermal plant in Loloho (located a ten-minute drive on a sealed road from Arawa, the provincial capital), compared to total production in Port Moresby then of 90.5 megawatts (World Bank 1988 vol. 2:34).

The North Solomons Province economy dominated those of the rest of the provinces. While accounting for less than five per cent of the total population of Papua New Guinea, North Solomons contributed 14 per cent of national income. BCL alone contributed nearly half of national exports. Thompson (1991:81) posits that an uninterrupted 1989 would have resulted in BCL contributing 30 per cent (430 million kina) of total exports, 11 per cent (315 million kina) of total GDP, 4,000 direct and another 8,000 indirect jobs, salary payments amounting to 52 million kina, and government revenues inclusive of employee tax payments of 184 million kina. North Solomons Province also led the provinces in terms of exports of cocoa and copra. There is little information on the sources of income for households other than the 1980 census that shows that 77 per cent of all rural households grew some cocoa and that cocoa and copra were the major sources of cash income for the bulk of the population. Within the mine-affected area, the average annual household receipt from cocoa growing was 807 kina; some 40 per cent greater than the 500 kina compensation payments received by households living within the mining-lease area (Thompson 1991). Cocoa was exported from Bougainville throughout the crisis, albeit at diminished rates. All cocoa produced is

exported, thus cocoa production is an excellent proxy for cash income receipts for most households in North Solomons Province. A total of 16,833 households were engaged in producing cocoa in 2010 (data provided by the Cocoa Board of Papua New Guinea).

The causes of the conflict on Bougainville are complex and many. Consequently, the coverage here is selective and succinct.<sup>5</sup> There were disputes between BCL management and the communities living downstream, on the environmental impact of mine tailings;<sup>6</sup> simmering differences within landowner groups over the distribution of compensation and land rents; and growing tensions among the various groups within Bougainville as well as those from outside on perceived inequities in income distribution and job opportunities from the mine (Thompson 1991). Many historians attribute the conflict to the difficulty of reconciling traditional expectations of reciprocity with payment of compensation and royalties; the shoddy nature of the work identifying stakeholders and landowners when the mine was first established; and the botched attempt by the police at resolving the conflict, following the first series of explosions (Ogan 1991; Regan 1998; Wesley-Smith 1991). Furthermore, there were demands for secession in the lead-up to independence (in 1975) of Papua

Figure 2: Per capita income by province, Papua New Guinea, 1983



Source: World Bank (1988:36, 98)

New Guinea from Australia (Ata 1998) and protests by the local landowners against the issuing of mining leases by the colonial administration for the 12,500 hectares to be used for the mine site, access roads and waste disposal (Hyndman 1991). Thomson (1991:69) claims that 'economic causes are by far the most important'.

Initial attempts at resolving the conflict were botched, with ramifications for peace decades later. The national government saw the sabotage of BCL activity as criminal behaviour and responded by sending in its Police Riot Squad from the mainland to bring those responsible to the courts. The conflict turned violent when police used force to apprehend those thought responsible. Their failure to contain the situation led to the deployment of soldiers from the mainland, which escalated the violence further while creating a lasting rift between locals and security forces (Regan 1998). The police and soldiers employed the tactic of bringing communities into submission and in the process committed acts of 'random human rights abuses (assaults, rapes, extra-judicial killings, and burning of villages)' (Regan 1998:277). Misconduct among the police and members of the disciplinary forces was rife with 'numerous reports of harassment and intimidation of Bougainvilleans' (Wesley-Smith 1991:194). The fact that members of the disciplinary forces were from outside Bougainville brought an ethnic dimension to the conflict, solidifying resistance from the locals. Consequently, what started as a conflict between BCL and the communities surrounding the mine quickly escalated into an ethnic conflict, and one that later took on secessionist dimensions (May and Spriggs 1990). The entire province was drawn into a violent conflict between the islanders and (mostly) the mainlanders that commenced with the threshold level of 25 battle deaths on 28 October 1989 and ended at the end of the 1996 calendar year (Gleditsch et al. 2002).<sup>7</sup>

The conflict worsened, dragging the economy with it following the imposition of an embargo on the supply of goods and services to the province by the national government in May 1990. The events leading to the embargo were the signing of a ceasefire agreement on 1 March and the universal

declaration of independence by the Bougainville Revolutionary Army (BRA) on 17 May. There were anti-BRA factions who cooperated with the Papua New Guinea Defence Force (PNGDF) during the crisis, but following the departure of the PNGDF the conflict quickly degenerated into localised fighting (Regan 2007). The BRA and its loose and often undisciplined factions turned against each other and those perceived to be sympathisers of the now-departed PNGDF. The fighting fractured the communities, leading to the formation of locally organised resistance groups (referred to as Home Guards), of which the Buka Liberation Front was among the first. Thus followed a multifaceted civil war within Bougainville (Regan 1999). The ensuing death and destruction led to a request by some communities for a return of the PNGDF to restore law and order.<sup>8</sup> The PNGDF returned to parts of Bougainville, starting from Buka in late September 1990. The embargo was lifted in September 1994 following international pressure on the Papua New Guinea Government to allow supplies of food and medicine into the province after reports of a series of health problems surfacing in Bougainville (Wesley-Smith 1991:192). Regan (1999), however, notes that the embargo operated informally until 1997, weighing heavily on exports of cocoa and copra from Bougainville and cutting off supplies of imports into the province. The ensuing hardships in accessing basic needs including medicines and cash deepened the resentment of the locals to the Papua New Guinea nation state. The civil war was brought to an end through a series of internationally mediated peace talks that finally bore fruit in mid-1997.

The ten-year conflict caused considerable devastation. While hard data on the levels of economic activity are absent, there is anecdotal evidence to suggest that incomes collapsed. Cocoa production, for example, fell steadily from 12,903 tons of dry bean in 1988 to 2,619 tons in 1996: on one calculation, just 12 per cent of the potential output. The latter, as shown in Figure 3, is calculated as the additional 5,747 tons of cocoa Bougainville on average produced annually to the decade to 1988 in comparison to East New Britain, the second-largest producer of cocoa in the country.<sup>9</sup> On this comparison, cocoa production in

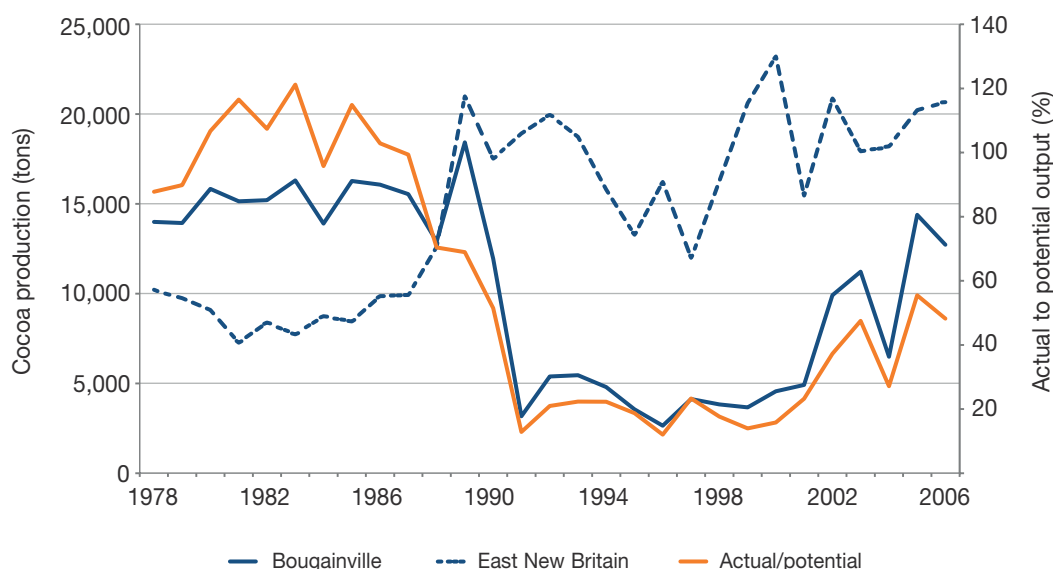
Bougainville had recovered to 48 per cent of the potential production by 2006. The comparison after 2006 is difficult due to the devastating impact of the cocoa pod borer, a pest that reached East New Britain in 2007 and had crossed over to northern Bougainville by 2009. The fall in cash income within Bougainville could have been larger still since the closure of the mine left many workers unemployed and businesses providing support services derelict. Cash flow ground to a trickle and basic needs including medicine and fuel were being smuggled in during the embargo. The blockade of Bougainville via the embargo was designed to deprive the BRA of imports and export income and it had the desired effect (Wesley-Smith 1991). The economic impact of the crisis varied across the region with south and central Bougainville hardest hit from the embargo while a trickle of cocoa continued to flow out of Buka.

Similarly, access to basic services deteriorated as roads, schools and hospitals were ‘cooked’ (burnt). Regan (1999:59) recalls that North Solomons Province ‘had the most effective provincial administration and local-level government systems in Papua New Guinea.’ By

December 1997 when truce was reached most of the infrastructure had been destroyed and the provincial government was left leaderless. In 2011, charred remains of buildings and destroyed infrastructure confronted the author to what was once a thriving community. The cost of war in terms of lost lives, production, and opportunities for improved wellbeing of the residents remains to be assessed. A detailed count of battle deaths, a measure widely used to gauge the severity of fighting, is absent. However, estimates range from 1,000 to 20,000 deaths with another 60,000 of a total population of 160,000 reported to be living in care centres (constituting internally displaced people) at the height of the crisis in 1996 (Braithwaite et al. 2010). The conflict caused deep divisions both within Bougainville and between the people of Bougainville and the rest of Papua New Guinea, divisions that persist well after the war.

Several attempts were made to broker peace (Table 1). At least 10 peace agreements were negotiated between the warring parties before fighting was brought to an end. Community elders, civil society, traditional elders and women’s groups all contributed to the negotiation for

Figure 3: Cocoa production in Bougainville and East New Britain provinces, 1978–2006



Note: The potential output of cocoa for Bougainville is created as the production from East New Britain plus 5,747 tons — the average difference in annual production from 1978 to 1988.

Source: Data from Cocoa Board of Papua New Guinea

peace. A truce was reached between the parties in conflict in December 1997 through mediation by the government of New Zealand, and a ceasefire agreement was reached in April 1998. Peacekeepers from Australia, New Zealand, Fiji, Tonga and Vanuatu monitored the ceasefire agreement from December 1997 to December 2003. Bougainville had its first elections for a new (autonomous) government in 2005, following which the observer mission from the United Nations left satisfied with the outcome. The autonomous region had its second election for parliament and the office of president in 2010. While a 'no go zone' surrounding Panguna mine in central Bougainville remains restricted to most visitors, peace has prevailed since July 1997. The economy is recovering. An assessment of the extent of this rebound is the subject of the next two sections.

The economy, using data on actual production vis-à-vis potential production of cocoa as depicted in Figure 3, hovered at less than 30 per cent of potential output between 1989 and 2002. Annual cocoa exports collapsed from 11,924 tons in 1989 to 3,146 tons during the embargo — equal to

13 per cent of potential exports. Annual cocoa exports bottomed out at 2,619 tons for the year to October 1996 — equal to 12 per cent of the potential production. There has been a slow pick-up since half the potential output (vis-à-vis the pre-crisis output relative to the output of East New Britain) was reached in 2006. The collapse of the economy and its rebound mimics the chronology of the major attempts at reaching truce (Table 1). Data on income and levels of access to services are unavailable and were collected using a household-level survey. Such data provide a more recent and granulated picture of the rebound in the economy in terms of access to basic services. Data collection in a post-conflict environment presents several challenges, which are explained below.

### Data Collection Methodology

The logistics of conducting household surveys in an unstable post-conflict environment are demanding. Approval from the University of New South Wales Human Research Ethics Advisory Panel was first secured. While gaining the approval was in itself a challenge, the application process proved valuable

**Table 1: Chronology of truce attempts since the beginning of the conflict**

Number	Date	Event
0	November–December 1988	Explosives stolen from Panguna mine on 22 November. Power pylons supplying electricity to the mine blown using the explosives on 25 November. Police Riot Squad deployed from mainland in December.
1	May 1989	Namaliu Peace Agreement between the Bougainville Revolutionary Army and PNG Government. (BCL closes operations on 15 May.)
2	October 1989	National government peace package, which is rejected by Francis Ona a month later
3	March 1990	Bougainville Ceasefire Initiative — international observers arrive on 13 March to monitor withdrawal of PNGDF and surrender of weapons, but withdraw three days later
4	August 1990	Endeavour Accord signed by the Bougainville Revolutionary Army and PNG Government
5	October 1990	Kavieng Agreement calling for the national government to restore law and order and services on Buka Island
6	January 1991	Honiara Declaration on restoration of services on Bougainville
7	October 1994	North Nasioi Peace Agreement
8	July–October 1997	Burnham I involving talks between leaders within Bougainville (July) and Burnham II involving talks for peace between the national government and leaders from Bougainville
9	January 1998	Lincoln Agreement
10	April 1998	Arawa Ceasefire Agreement
11	August 2001	Bougainville Peace Agreement

Sources: Australian Government (1999), Regan (1999)

in planning for the survey.<sup>10</sup> Security of the researchers in a post-conflict situation is of utmost concern. Then there are issues of winning trust of the community; being able to harness local capacity for conducting the surveys; obtaining information on the population to allow for appropriate sample selection; deciding on the variables on which to collect data; and being able to fund the survey. Each of the above is elaborated upon next.

### Gaining Entry into the Community

Gaining entry into the community is crucial for containing security risks to the researchers and critical for maintaining the quality of the collected information. Partnerships were made with two research institutions: the National Research Institute (NRI) — a government-funded policy think-tank based in Port Moresby — and the open campus of the University of Papua New Guinea (UPNG) located in Buka, the post-conflict capital of Bougainville. The project recruited 27 students through UPNG and trained them in the conduct of the survey. The training was done three months ahead of the actual survey. Part of the training involved familiarisation with the objectives of the research, the use of a camera and a hand-held global positioning system (GPS) instrument, and the piloting of the questionnaire in the surrounding villages of Buka. The trained personnel were issued certificates as research assistants.<sup>11</sup>

The Autonomous Bougainville Government was invited by the NRI to partner in this research. The chief administrator opened the workshop for the trainees where he emphasised the need for socio-economic data for planning purposes. We did two radio interviews on the research explaining its objectives and announced that the collected information will be put in the public domain. Several trainees used their church and village networks to broadcast news of the impending survey. One of the research assistants was a paramount chief in her community, another two were former BRA commanders, and many more were devout Christians. Their networks and the three-month lead time lent the opportunity to broadcast the plans for the household survey.

In the week of the survey, village heads and community elders were approached for their permission to conduct the survey; the reasons for the research were explained and a promise given that the findings would be presented to the community later in the year.<sup>12</sup> A similar meeting was held with the head of the Meëkamui government. All of these meetings were cordial and a few of the discussions took place in Tok Pisin (Papua New Guinean pidgin), where the research assistants provided critical support. In the field, each member of the team wore a uniform in the form of a dark gold T-shirt (as advised by one research assistant) that had the NRI logo stamped on it and a cap displaying the logo of the University of New South Wales. Thus, every attempt was made to make the purpose of the survey and the identity of the surveyors as transparent as possible. This worked as households we subsequently visited knew of our presence and cooperated with the survey.

### Drawing in Local Knowledge and Capacity

UPNG students proved critical to the conduct of the survey. The interviewers were trained in survey techniques and informed of the objectives of the exercise. They knew the context, spoke the language, and were familiar with the culture and the community. The community standing of the resident director of UPNG, who was also part of the research team, and his role in the recruitment of the interviewers, were critical to the success in the field. A project coordinator was recruited through the NRI who then managed the logistics of hiring the venue for training and for accommodation and payment of the researchers. The coordinator, being from Bougainville, also helped in providing access to the community.

Interviewers were sent in pairs. Each interview team was made up of a man and woman with at least one of them familiar with the local language and custom. The entire team of interviewers moved together in cohorts from one location to another, which helped with security and logistics of transport. They were paid a daily stipend and each pair was given a credit of five kina to allow for use on their mobile phones for communication while in the field.



The entire research team was accommodated at a single guest house in each region visited. This permitted a daily debrief on the qualitative information gathered, the exchange of lessons from the day, the entry of the collected data into a database, and the audit of the collected information. It also provided time for bonding and sharing of the information with the locals who worked at the guesthouse.

### Sampling

The last complete population census on Bougainville was conducted in 1980. The next census, conducted in 2000, missed the conflict zones in central Bougainville and, as we discovered during the survey, several other villages in south Bougainville. Villages had moved in the 31 years, making the 1980 census of little use in sample selection.<sup>13</sup> Furthermore, people moved both during and since the conflict; thus information on the distribution of the population and locations of economic activity is largely absent. Given the challenges of logistics, we confined our fieldwork to the four main urban centres: Buka (north island-Bougainville), Selau (north mainland Bougainville), Arawa (central mainland Bougainville) and Buin (south mainland Bougainville) (see Figure 1).

The survey boundaries were drawn prior to fieldwork. Google© (satellite) Maps provides a reasonably accurate picture of residences in the urban centres (Figure 4). This is not so for rural areas and particularly those in the highlands, which are often under thick cloud cover. Thus, urban centres were marked on maps for the survey and a hand-held GPS instrument was used to reconcile observations on the ground with the maps. A stratified random sampling approach was used where one household was chosen at random from every cluster of 10 counted when approached from one end of the town boundary. Permission was first sought from the head of the household to record the location and take a picture of their home. Only then were the GPS coordinates recorded and a picture of the residence taken. These spatial data permit audit of our sample selection, and provide the opportunity for future longitudinal analysis.

Figure 4: Survey boundary for Arawa



Source: Plotted using Google Maps© and GPS coordinates recorded (not shown) as part of the household survey conducted in February 2011

A survey team then proceeded to administer the questionnaire. Two reserve households were preselected for every cluster of 10. In the survey of 181 households, seven households on the first reserve list were used and none on the second list had to be approached.

### Data Collected

The questionnaire comprised five blocks, and was completed in approximately 30 minutes. The first block was devoted to questions on the physical location of the household; the second focused on the attributes of the household head and the size of the household; the third concentrated on the status of living conditions including the size, type of building material used, and age of the dwelling; the fourth asked questions on the level and sources of income; and the last asked for information on the level of education for each member of the household. Information on the age and type of building material used (i.e. modern, traditional, or a mixture of the two) and the level of education by birth year was collected to enable the creation of a time profile of access to education (and by extension other basic services) and the levels of construction activity by type of building materials used.

## Costs

Conducting fieldwork in post-conflict environments is expensive. Two four-wheel-drive vehicles were hired, each costing 1,000 kina per day. Poor road conditions and frequent flooding left these vehicles stranded on a few occasions. Travel between urban centres had to be done in convoys for safety of the passengers. Costs of basic accommodation were approximately 250 kina per day per person.

The cash contribution for this research was funded through a grant from the Australian Civil Military Centre, while the University of New South Wales provided one PhD scholarship and the salary costs of its staff on the research team. NRI lent space to hold meetings in Port Moresby, and spared office and administrative support for the project coordinator. UPNG hosted research and training activities in Buka. Finally, the Autonomous Bougainville Government, including President John Momis, provided personal public endorsement to the research project.

## Some Preliminary Findings

Presented next are summary statistics in the form of a snapshot as of February 2011. Later, data is produced to reflect on the time profile of levels of access to services and investment. The latter is important given the absence of information on the conditions during the crisis.

Table 2 provides summary statistics on household characteristics for the 181 households that were interviewed during the survey. The second row from the top of the table shows that the average age of the household head was 45 years; the distribution of the age had a standard deviation of 11; and the youngest household head was 20 years while the oldest was 81 years. The third row shows that 58 per cent of household heads were males — a significant finding given that three (Arawa, Buka and Selau) of the four sites surveyed have matrilineal systems of transmission of rights to land held under customary ownership. The fourth row shows that 30 per cent of the households moved residence due to conflict; this is in contrast to pre-conflict Bougainville when internal migration was minimal. There are on average six people per household with an equal division between males and females, with two in school and a similar number of dependents — defined as those being either less than 15 years or more than 65 years of age. Some 56 per cent of the residences are reported to be owned by the household head; the average age of the residence was 15 years; and the mean reported household weekly income was 416 kina. The implied annual per capita urban income is 3,795 kina (at February 2011 prices and equal to 769 kina at 1983 prices when Papua New Guinea's GDP deflator is used) and equal to 39 per cent of the per capita income of North Solomons Province

**Table 2: Summary statistics on households surveyed**

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Age of household head	181	45	11	20	81
Male household head	181	58%	0.49	0	1
Moved house due to conflict	179	30%	0.46	0	1
Number of people per house	181	5.70	3.03	1	16
Number of males per house	180	2.85	1.76	0	9
Number of dependents per house	179	1.78	1.70	0	8
Number in school per house	179	1.89	1.84	0	8
Proportion owning house	181	56%	0.50	0	1
Year house built	112	1996	13.77	1960	2011
Household weekly income (kina)	180	416	317	<100	>1,000

Source: Based on data collected from 181 households surveyed in Arawa, Buin, Buka and Selau in February 2011

as a whole in 1983. Three qualifications are in order here. First, the reported household income excludes the value of subsistence production or the imputed rents of owner-occupied housing. Second, determining ownership of a house was problematic in Arawa, a town built on alienated land. Many household heads could not produce title deeds, claiming that they were living on their traditional land.<sup>14</sup> Third, our survey reveals the average per capita income for urban Bougainville, while the figure for 1983 is that for the whole province.

Data on the year of birth and the highest level of education attained was collected for each member of the households surveyed (1,014 individuals). Table 3 provides the age distribution of all individuals captured in the survey. One of every three survey participants was less than 15 years of age and nearly one-half less than 20 years of age. The average age of the individuals captured via this survey is 25 years and the frequency distribution by age, as shown in Figure 5, is not typical. The difference between the fitted normal and Epanechnikov kernel density plots, shown as line graphs, are negative for those between the ages of 22 and 48 (i.e. born between 1963 and 1989) and positive for those aged less than 22 or more than

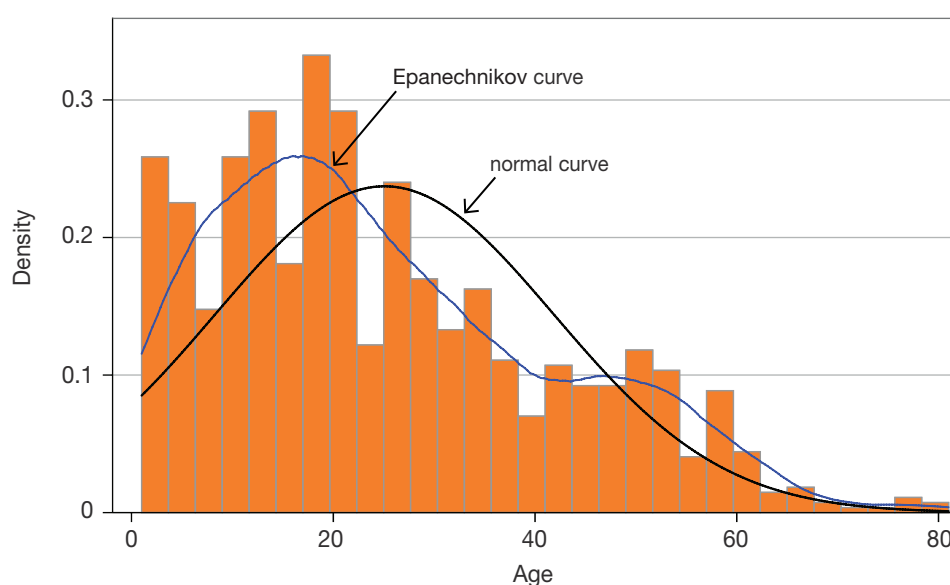
**Table 3: Population distribution by age cohort**

Age group (years)	Females (number)	Males (number)	Per cent of total	Cumulative per cent
1–5	50	53	10.2	10.2
6–10	53	58	10.9	21.1
11–15	55	74	12.7	33.8
16–20	81	59	13.8	47.6
21–25	61	55	11.4	59.1
26–30	42	42	8.3	67.4
31–35	41	38	7.8	75.1
36–40	26	23	4.8	80.0
41–45	24	21	4.4	84.4
46–50	30	26	5.5	89.9
51+	49	53	10.1	100.0

Source: Calculated from 1,014 individuals (502 males and 512 females) from the 181 households surveyed

48 years.<sup>15</sup> This gap in terms of fewer people within the 22–48 year age bracket and greater numbers on either side of this age group than what would be ‘normally’ expected could be due to a combination of sampling error, age-specific migration to urban centres, and greater mortality of children and young people during the conflict if birth rates remained stable over the past five decades.

**Figure 5: Population distribution by age**



Note: The normal (black) and Epanechnikov (blue) kernel density plots are shown as line graphs.

Source: Based on data collected from 181 households surveyed comprising 1,014 individuals in Arawa, Buin, Buka and Selau in February 2011

A summary of access to basic services by the sites surveyed is given in Table 4. Household heads are youngest in Arawa. The majority of residences there have internal toilets — a fact due to these houses being constructed by BCL. Access to electricity, banking services and telephones are best in Buka and worst in Buin. Only half of the 40 households surveyed in Buin, for example, had bank accounts and just one had a television. Thus, access to services differs considerably across the four survey sites.

A time profile of the level of access to education can be inferred by examining the highest level of schooling achieved by year of birth in the sample. Table 5 shows the proportion of individuals who reported as having not attended school at all depending whether they were of school age before (i.e. were at least six years of age in 1989 when the conflict erupted), during (birth years 1983 to 1991), or after the conflict (birth year 1992 to 2005). The data shows that 2 per cent of those of school age before, and a similar percentage for those of school age during, the crisis missed out on schooling altogether. However, 13 per cent of the school-aged population were not in school in the post-conflict era. Furthermore, 35 per cent of those between 6 and 10 years of age were not in school as of February 2011. The full distribution of the highest year of schooling by age is shown in Figure 6. The main drop-off years from school (and

their respective probabilities in parentheses) are: Year 6 (20 per cent if enrolled in primary school), Year 10 (28 per cent if survived Year 6), and Year 12 (33 per cent if survived Year 10). On the basis of these figures, the probability of a six-year-old ready to enter school in Arawa completing secondary school by age 18 is 11 per cent. That is, one in nine children that enter Grade 1 does not make it to Year 12.

Similarly, data on the date of construction of the residence, its floor space, and type of material used for construction was collected from the households surveyed. Figure 7 shows a time plot for Buka and Selau, the two survey sites with significant variation in this data, of the number of houses constructed using modern materials such as sawn timber, roofing iron and concrete. Construction in Buka picked up from 1995 to 2000 and then again from 2005 to 2010. These dates coincide with the episodes of peace. On the first, Regan (1999:43) notes that: 'Buka enjoyed relative normalcy from the early 1990s, and has been the main economic centre ever since' due to the early return of the PNGDF. The lack of similar activity in Arawa could be due to the lack of titles to the properties while the security situation in south Bougainville remains volatile. The media, for example, reported of fighting between resistance groups leading to fatalities in August 2011.<sup>16</sup>

**Table 4: Access to basic services by urban centre surveyed**

	Arawa	Buin	Buka	Selau	Total
Number of households surveyed	74	40	33	34	181
Average age of household head	43	47	45	46	45
Average number of people in the household	6	5	6	6	6
Proportion of households with access to electricity (%)	51	40	76	62	55
Proportion of households with an internal toilet (%)	93	18	42	9	51
Proportion of households with a television (%)	45	3	61	35	36
Proportion of households with a telephone (%)	88	90	97	76	88
Proportion of households having a bank account (%)	73	50	85	62	68
Average household weekly income at 2011 prices (kina/week)	486	328	427	355	416

Source: Based on data collected from 181 households surveyed in Arawa, Buin, Buka and Selau in February 2011

**Table 5: Survey participants with zero years of schooling by birth year**

Birth year	Females (number)	Males (number)	Proportion without schooling (%)
1982 or earlier	6	0	2
1983 to 1991	2	2	2
1992 to 2005	12	33	13

Source: Based on data collected from 911 individuals born in or before 2005 from the 181 households surveyed

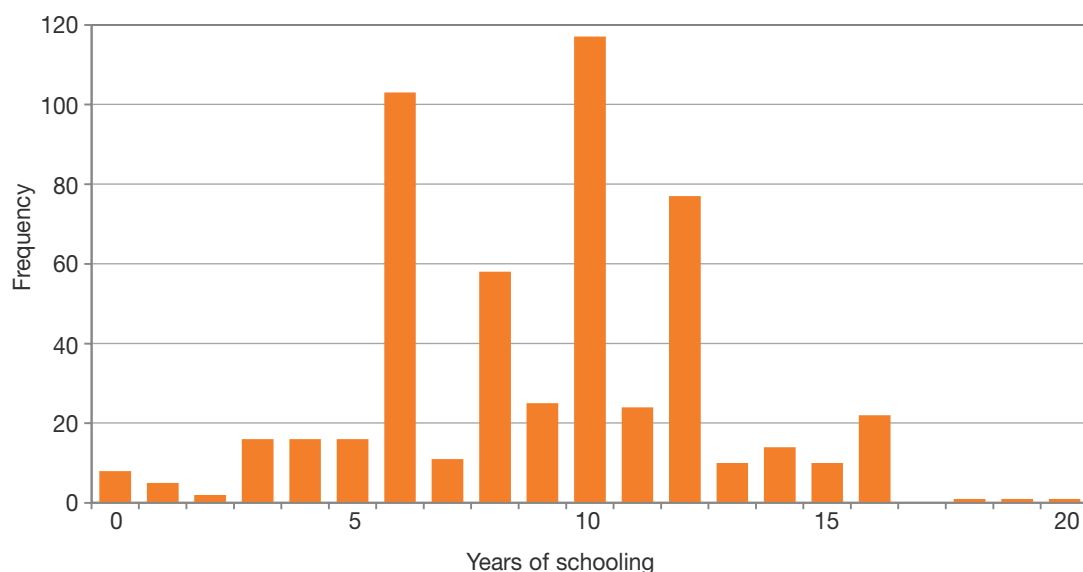
How much of the results reported above can be generalised? This is a question of external validity. The answer is that the findings here can be generalised only to urban Bougainville and thus hold true for less than 20 per cent of the total population.<sup>17</sup> The population of urban Bougainville comprises those who were moved to care centres at the height of the crisis and/or those able to make such a shift while basic services retracted from remote locations to the urban centres, and particularly to Arawa and Buka. Thus the composition of the urban population and the level of access to basic services are likely to be different

to that of rural regions. Nonetheless, the direction of bias in terms of income levels and access to basic services and age distribution of the population between urban and rural regions is well known. That is, levels of access to basic services in rural areas are poorer while the population there is on average, according to data from the (selective) 'population census' of 2000, younger. Thus these results have value in terms of informing policies and planning strategies of the national government and the government of the Autonomous Region of Bougainville.

### Conclusion and Policy Implications

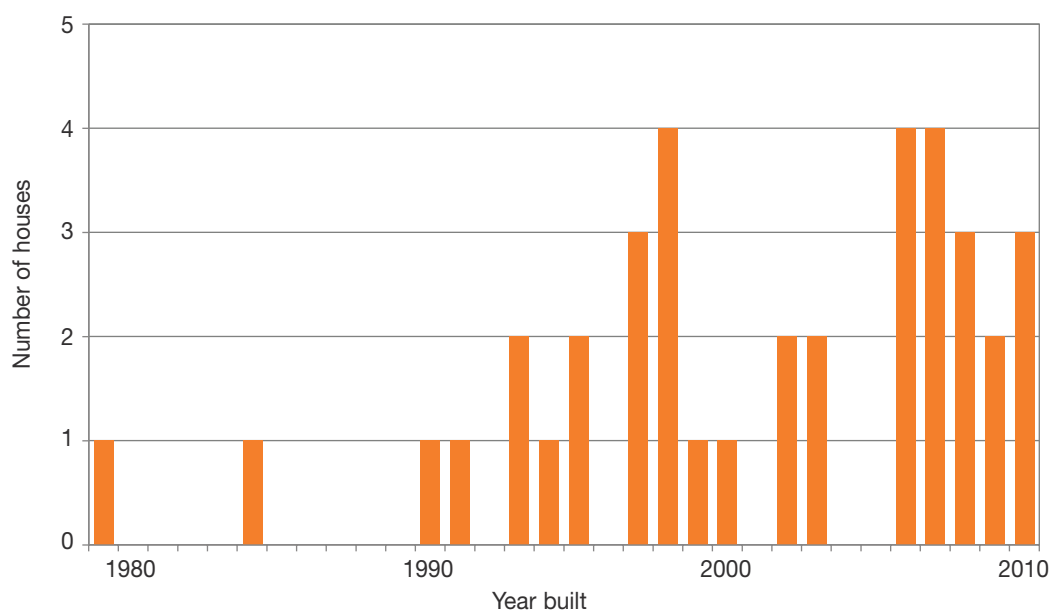
Socio-economic indicators in Bougainville are rebounding. That is, access to services and income has improved since the cessation in 1997 of the decade-long violent conflict. This paper has provided the first glimpse of the extent of recovery following the installation of peace. I have drawn on data on aggregate cocoa exports from 1978 to 2006 to paint a time profile of the macro economy of Bougainville. Missing from the above is mining output, which collapsed in 1989. I complement the macro-economic picture with household-level survey data collected in February 2011 to illustrate

**Figure 6: Frequency distribution for years of schooling for those aged 20 years and above**



Source: Based on data collected from 514 individuals who were aged 20 years or above from the 181 households surveyed

Figure 7: Construction of modern houses in Buka and Selau



Source: Based on data collected from 67 households surveyed from two urban centres in Bougainville

the socio-economic conditions of the population. The data are used to re-create information on conditions for investment and levels of access to basic services during the conflict.

The use of age and the highest level of schooling attained provide a means to reconstruct a time profile on the level of access to basic services. Similarly, data on the age of residences and types of building materials used for construction provide information on the conditions for investment. The latter also provides information on the perception of the population on peace prevailing into the future. In particular, the recent growth in construction of modern structures signals that investors have confidence in peace prevailing over the life of the building. It could also provide evidence on improvements in access to income and credit. Building materials other than sawn timber are imported and thus require cash. Similarly, the growth of modern structures in each of the four centres surveyed as captured by the pictures taken of residences suggests that the owners are confident that these structures will not be 'cooked' in future.

There are several lessons for policymakers from the data collected in this survey. First, internal migration spiked during the conflict, implying

that restoring damaged infrastructure for delivery of basic services may not be the most appropriate means to improving access to basic services. Second, the movement of people raises question of rights to land the settlers have since occupied. This places priority to resolving disputes on rights to land settled on since the commencement of the conflict. And third, the large young population places urgency on the supply of public goods and job creation for the foreseeable future. The latter demands improved conditions for private enterprise so as to provide income and employment opportunities for the youth who will be entering the workforce for decades to come.

The logistics of conducting a household survey in a post-conflict environment are demanding, but careful planning and sufficient resources can allow for data collection in difficult environments. Critical to the progress made with data collection for this paper were: (i) employment and training of local researchers; (ii) publicity on the purpose of the household survey; and (iii) partnership with the community and the households who volunteered the information. Obtaining human research ethics approval, while a painstakingly demanding exercise, is helpful in the planning of the survey itself. One

important lesson from this work is that honesty and transparency (with some modesty on what a household survey can deliver) can go a long way to winning the confidence and support of the surveyed population.

How does a bounce back in the economy affect the sustainability of peace in Bougainville? Reassuringly, there is a body of research showing a strong negative relationship between the health of an economy and the incidence of conflict. Thus policies targeted at raising income and improving access to basic services can be critical backstops to conflict recidivism in Bougainville.

### Author Notes

Satish Chand is Professor of Finance in the School of Business at the University of New South Wales and an Adjunct Professor at the Australian National University. His research interests include labour migration, land-tenure reform, and entrepreneurship and employment in fragile states.

### Endnotes

- 1 I am grateful to the Australian Civil Military Centre and the University of New South Wales for funding this research, to the National Research Institute and the University of Papua New Guinea (UPNG) for their assistance in conducting fieldwork in Bougainville, to the 28 research assistants from UPNG for administering the survey, to the 181 households who participated in the survey, and to two knowledgeable anonymous reviewers for their helpful and encouraging comments. Naturally, I am responsible for any errors in the paper.
- 2 At 31 March 1988, one kina was worth US\$1.33 (World Bank 1988:iii).
- 3 The population of North Solomons Province as of the 1980 census was 125,506. Assuming an annual growth rate of 3.4 per cent as reported by the World Bank (1988:107), the population in 1988 would have been around 164,000.
- 4 This average figure masks the large variation in income within the provinces.
- 5 See Braithwaite et al. (2010) and Regan (2010) on the causes of the conflict and the negotiations to peace.
- 6 The two rivers most affected by the mining were Jaba and Kawerong (which both drain into Empress Augusta Bay), as reported in a PNG Government-commissioned report and quoted extensively in Thompson (1991).
- 7 The Uppsala Conflict Data Program defines an armed conflict as 'a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in one calendar year'. See <<http://www.pcr.uu.se/research/ucdp/definitions/>>.
- 8 The Chiefs of Buka published a letter in the *Post-Courier* of 24 September 1990 requesting a return of the PNGDF.
- 9 The qualitative conclusions are unaffected if the counterfactual level of production for Bougainville is inflated by a factor of 1.69, the average for 1978–88, of the cocoa output for East New Britain.
- 10 The approval was granted on 2 September 2010; reference number A-10-40.
- 11 One of the trainees has since secured a job with a private company to conduct surveys in another province.
- 12 We were informed by one household head that the promised gift from an earlier survey was yet to arrive.
- 13 One reviewer of an earlier draft of this paper pointed out that the locations of villages are 'still defined partly according to colonial divisions that in some cases are 70 years out of date'.
- 14 It was decided not to push a clear response on this issue given its political sensitivity and the centrality of the dispute on rights to land in the conflict.
- 15 For those aged between 22 and 48 years as of 2011, the difference between the sexes was not significant.
- 16 The *Post-Courier* (online) reported on 19 August 2011 that: 'Yes, there are killings, there are guns still being used and innocent lives terrorised, women, children and youths affected and most importantly the service delivery mechanism is not effective in the area because of the infighting.'
- 17 According to the 1980 PNG population census, the urban population for North Solomons was 15.8 per cent of the total. This figure would have increased due to rural-to-urban migration since 1980.

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The State, Society and Governance in Melanesia Program acknowledges the generous support from the Australian Government for the production of this Discussion Paper.

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