

**BUILDING COMMUNITY RESILIENCE IN  
MINE IMPACTED COMMUNITIES:  
A STUDY ON DELIVERY OF HEALTH SERVICES  
IN PAPUA NEW GUINEA**

A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

in

Development Studies



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## **Building Community Resilience in Mine Impacted Communities**

## Abstract

The purpose of this study was to explore the building of Community Resilience in mine-impacted communities in Papua New Guinea (PNG). The study aimed to establish the general relationship between community resilience, community capitals and the delivery of health services. It investigated the delivery of health services in three mining communities in PNG to see how these services contribute to or detract from the building of resilience. The study investigated relevant models of community resilience from the literature, and how the way policy functions in PNG can be related to these models. The study also developed a way of quantifying the impact of mining on health service delivery (through the use of community capitals) and the building of resilience in these communities. Furthermore, the thesis develops an indigenous, Melanesian-centric 'Bilum Framework' approach to resilience to create greater understanding of how resilience in the mining communities can be strengthened through improved access to health services.

Three mining communities were selected as case studies, each representing a different stage of mining: (i) the beginning; (ii) the operational; and, (iii) post-mine closure. A mixed method approach comprising both quantitative and qualitative methods was used to collect data for this study. A survey questionnaire was designed to collect views of community members who accessed health services in their respective communities. Results from the survey questionnaire were converted to proxy indicators and led to the development of a Community Resilience Index (CRI) to provide a measure of resilience in each community. The qualitative research methods included document analysis, semi-structured interviews, and purposive observations. Document analysis was important in reviewing relevant policy documents and other literature to link theories to the experiences of the people while the latter methods contributed to describing people's encounters in accessing health services.

Analysis showed inconsistencies in the levels of resilience in these communities that varied with the stages of mining: both the beginning and post- mine closure stages

demonstrated significantly lower levels of community resilience than the operational phase. Findings from the research indicated a lack of access to health services – a key influence in building resilience – is the result a range of factors including insufficient finances, weak sector governance, and the need for infrastructure and transport. The Bilum Framework is proposed as an approach that allows decision-makers to target assistance to strengthen and support specific community capitals and hence more effectively build community resilience in the mining communities in PNG.

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## ACRONYMS

APACC	Asia Pacific Accreditation and Certification Commission
ASM	Artisanal and Small-scale Mining
AusAid	Australian Agency International Development Programme
ADB	Asian Development Bank
BCL	Bougainville Copper Limited
BPNG	Bank of Papua New Guinea
BRCS	Brief Resilience Copy Scale
BSP	Bank of South Pacific
CAM	Complementary and Alternative Medicine
CCs	Community Capitals
CCHA	Catholic Church Health Agency
CHPs	Community Health Posts
CHWs	Community Health Workers
CMCAs	Community Mine Development Agreements
CoM	Chamber of Mining
CR	Community Resilience
CRI	Community Resilience Index
CSR	Corporate Social Responsibility
DCD	Development Coordination Branch
DEC	Department of Environment and Conservation
DMPGM	Department of Mineral Policy and Geohazard Management
DoNPT	Department of National Planning and Treasury
EIU	Economic Intelligence Unit
GoPNG	Government of Papua New Guinea
HEO	Health Extension Officer
HIV/AIDS	Human Immunodeficiency Virus
IBSA	Integrated Benefit Sharing Agreement
IMR	Infant Mortality Rate
ISOS	International SOS
JTAI	Jane Thomason and Associates Inc.
KRAs	Key Result Areas
LGL	Lihir Gold Limited
LICHP	Lihir Island Community Health Plan
LINLLG	Lihir Island Nimamar Local Level Government
LLGs	Local Level Governments
LMALA	Lihir Landowners Association
LMC	Lihir Medical Centre
LRN	Low Risk Notification
LSDP	Lihir Sustainable Development Plan
MAC	Mining Advisory Council
MCH	Maternal Child Health
MD	Managing Director
MDC	Mining Development Contract
MHC	Maternal Health Care
MICs	Mine Impacted Communities

MoA	Memorandum of Agreement
MOMASE	Morobe Madang Sepik
MML	Misima Mine Limited
MMR	Maternal Mortality Rate
MR	Mortality Rate
MRA	Mineral Resource Authority
MTDS	Medium Term Development Strategic Plan
MTSA	Misima Towohu Landowner Association
MRDC	Mineral Resource Development Company
NDA	Nimamar Development Authority
NGOs	Non-Governmental Organisations
NHP	National Health Plan
NIIPG	New Ireland Interim Provincial Government
NLLG	Nimamar Local Level Government
NRI	National Research Institute
NTDS	Non Treatable Diseases
OTML	Ok Tedi Mine Limited
OLPLLG	Organic Law on Provincial and Local Level Governments
PDA	Porgera Development Authority
PGs	Provincial Governments
PHC	Primary Health Care
PNG	Papua New Guinea
PNGSDP	Papua New Guinea Sustainable Development Programme
PPLLGSPA	Porgera-Paiela Local Level Government Special Purpose Authority
PPP	Public Private Partnerships
PSOC	Psychological Sense of Community
SMLs	Special Mining Leases
STIs	Sexually Transmitted Infections
TB	Tuberculosis
TCS	Tax Credit Scheme
UNDP	United Nations Development Programme
WB	World Bank
WBG	World Bank Group
WHO	World Health Organisation
WHP	Western Highlands Province



# Chapter 1

## Introduction

*I interviewed a family made up of the father, and his two daughters one of whom appeared to be in her late teens or early 20s, and another who was only 5 weeks old. The mother had died in childbirth in a provincial hospital. They had brought the 5 weeks old baby to the rural health centre to be treated for a cough, but were told there was no cough mixture by the community health worker (CHW) who was on duty at that time. The next day I saw the young girl in another location within the district without her 5 weeks old sister, I asked her where the baby was and she replied 'em dai aste', meaning the baby had died yesterday. I found that both the father and his young daughter left school after only three years of schooling and since then they have not attained any other education or training. I also found out that the father and his young daughter took the baby home with no training<sup>1</sup> (post-natal knowledge) to prepare them to care for the baby.*

Life for mothers, children and infants in Papua New Guinea (PNG) is tenuous, with high infant, child and maternal mortality. So stories of this kind are common. This family, though, lived in a region where a large-scale mine had been operating for 12 years and the community had received substantial sums of money, and higher levels of service delivery than most parts of the country. Why is it that this family unit could not get the health care they needed, due to either services being poor or they themselves not having the knowledge, skills or resources to prevent the child becoming so ill to begin with before they sought assistance? How is it that this family unit was vulnerable, so at risk, and so non-resilient, given the resources pouring out of their region from the mine and the compensation payments flowing in?

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<sup>1</sup> **Postnatal Care** (*Puerperium*) covers the 6-week period following birth.

## 1.1 Introduction

This thesis focuses on understanding the notion of community resilience in mine impacted communities in Papua New Guinea. The research uses the case of health, and specifically the delivery of health services, as a lens into resilience for three of these communities. The resilience and sustainability of these communities is explored through the concept of Community Capitals (CCs) (Callaghan & Colton, 2008; Poortinga, 2012, Robinson & Carson, 2015). Community Capitals in this study are natural, human, financial, cultural, social, political, and built capitals. In this thesis, the CCs are also viewed through a Melanesian lens: I propose a 'Bilum Framework' to better illustrate the ways in which strengthening these entwined capitals can build community resilience. The Bilum<sup>2</sup> is a traditional PNG bag either knitted or woven by hand, and is chosen as a metaphor to be applied in this thesis because the many strings used to weave it resemble the interactions of community capitals that can build more resilient communities. An explicit aim of the research is to understand how the strengthening of the various capitals can improve resilience in order to achieve more sustainable communities.

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<sup>2</sup> The 'bilum' in Tok Pisin, a Melanesian Pidgin, one of PNG's three official languages (Franken & August, 2011) and is a traditional bag knitted by hand. The Bilum is used as the conceptual framework for this study because of its multiple uses both in the past and contemporary PNG. The Bilum is mainly knitted by women, but there are also exceptional cases where men participate.

## 1.2 Background to the research

This study is focused on communities impacted by large-scale mines in PNG. The development of the mining sector has contributed significantly to the development of the country's economy and will continue to do so for many years in the future. The export of mineral resources (including oil) alone has made up over 50 per cent of the value of total exports since Independence. Government revenues are also heavily dependent on large-scale mining (Bank of Papua New Guinea (BPNG) 2011, 2012). This high reliance on minerals means that PNG is categorised by the World Bank as 'mining dominated' referring to the fact that mineral revenue accounts for more than 50% of all exports (Pegg, 2003).

High revenues generated from the mineral resources could imply that communities around mining areas in PNG have access to resources to make a better life. However, a study by Pegg (2003) reveals (like many others) that higher revenues earned from mineral exports are not related to a higher level of social indicators. Within the PNG context, several authors have argued that mining is less beneficial to community development because of the fact that despite its dominance, its benefits have not trickled down to the majority in the communities within the mine impacted areas. For example, Banks (2003), Filer and Macintyre (2006), Taylor (1997), and Kepore and Imbun (2011), all concur that the mining industry in PNG has not contributed effectively towards achieving tangible improvements in livelihoods among local communities. There are more documented negative impacts than positive tangible results (such as a reduction of social problems), and hence for many the mineral

resources can be seen as more a 'curse' that has created dependency rather than a 'blessing'.

The evidence further suggests that stakeholders who rely heavily on the benefits of mining over time develop a dependency on this resource for these benefits (Lane & Rickson, 1997, p. 127; Pegg, 2006). Not only do these stakeholders depend heavily on the benefits generated from the mine but as it turns out many are confronted with additional problems. People in mine-impacted communities whose livelihoods depend on the mine also have high expectations of the lasting benefits these mines generate. The following discussion presents some experiences of the communities affected by mining in PNG so as to demonstrate how dependency and the resource curse create challenges for the promotion of community resilience so as to achieve more sustainable communities across all stages of mining.

In mineral dependent countries, most of their external revenue is generated from the export of minerals. These benefits complicate the development of the mining communities by contributing to very fast and uneven growth particularly in relation to revenue flows (financial capital), and infrastructure (built capital). This creates the 'paradox of plenty' (Paredes, 2010; Ross, 2013), such that where financial and built capital in the mine impacted areas develops rapidly, this can concurrently create gaps in other community assets (in terms of, for example, political and social capitals) and undermine social prosperity. We start to see political, social and economic inequalities amongst the landowners, the wider community, and other beneficiaries of mining benefits, and between those living in non-mining areas (Langton, 2010).

Examples from other countries in South America, South Africa, and Asia revealed those countries depending on mining to be enclave economies that rely heavily on the revenue from the extractive industries (Hilson, 2004; Akabzaa, 2009). This undermines the significance of other industries such as agriculture and tourism, and PNG is no exception (Jell-Bahlsen & Jell, 2012; Filer & Macintyre, 2006). The challenge of mineral dependent countries is also explained by the concept of 'Dutch Disease' where a country's mineral boom distorts fair competition among other non-mining sectors (Usui, 1997; Wijnbergen, 1984). This point is further supported by the Bank of Papua New Guinea (BPNG) Annual Reports (2011, 2012) where the percentages of exports derived from mining were higher than other sectors such as agriculture. The concept of the '*paradox of plenty*' implies both the wider resource curse and the more specific, economic notion of the Dutch disease. Each of these is co-related and goes some way to explain the pathologies created by the supposed benefits of mining. The health sector and thus delivery of health services in the mine impacted communities is not exempted from this. This sector within these communities faces its share of challenges in delivering services and ensuring easy access to these services by all in the community.

### **1.3 Health services in mining communities in PNG**

The delivery of health care is used as a case study in this thesis to analyse the building of resilience in the selected communities. Healthy communities, the literature suggests, are more resilient in the face of social-economic and environmental changes



(Keim, 2008). Hence the provision of appropriate, accessible and affordable health services can strengthen resilience. This study proposes that the pathway for this connection is through the effects of large-scale mining on the different 'community capitals', conceptualised here through a 'Bilum Framework'. The study investigates the extent to which the benefits and the costs of mining filter down to sectors such as health in the impacted communities. Users of the health services in the mining communities can often encounter difficulties such as lack of transport, and long distances to the health facilities despite expectations that mining operations, established in some of the most isolated locations, would make services more accessible to the people. Studies on accessing health facilities elsewhere in PNG revealed that community members typically walked long distances, and this had a direct effect on their willingness and ability to seek health care (Müller, Smith, Mellor, Rare & Genton, 1998; James, Nadarajah, Haive & Stead, 2012). In this sense, then, the mine-affected communities do not appear to be advantaged by their proximity to the large-scale mining operations, and still have to deal with the negative effects — including many on health — that are associated with these operations. Having outlined the background to this study and the rationale for the focus on health services the problem statement will be outlined in detail.

#### **1.4 Problem statement**

Papua New Guinea's high revenue from mineral resources is seen by some as a form of successful development, while others argue that the revenue flows are a contributing factor to the challenges faced in the impacted communities (Banks, 2005; Filer, 1990).

Several scholars (Filer, 1999; Filer & Macintyre, 2006; Gilberthorpe & Banks, 2012; Jackson, 2002; Jell-Bahlsen & Jell, 2012; Kepore & Imbun, 2011) have commented that the landowner equity, compensation payments and other benefits of mining resources are not obviously contributing to more positive community development either at the beginning of mining, during operations or after mine closure. This can be seen as a form of a resource curse. Moreover, the lack of relevant policy support and actual service delivery by the PNG government, despite earning high revenue from mining, has led to a lack of government services delivered in all stages of mining (Hilson & Banchirigah, 2009; McKay & Lepani, 2010; Thomason & Hancock, 2011).

Several studies (Hammar, 2010; Johnson, 2011) have linked negative health impacts caused by the direct effects of mining such as the lack of safe drinking water and a reduction in the available garden land and more generalised effects such as the problematic use of compensation monies, growing inequalities, an increase in alcohol consumption and domestic violence, as well as rising rates of sexually transmitted diseases including HIV/AIDS. In some of these communities the provision of health services by the mining companies has also measurably contributed to the improvement of some health outcomes (Bentley, 2011; Banks, 2010). There have been improvements in infant mortality, and maternal mortality rates recorded on Lihir as well as improved control of malarial infection. On the other hand, there have been increases in lifestyle diseases, such as diabetes in some of the communities. Population increases from inward-migration from within the mining Province and around PNG have increased the exposure to infection and other health issues, as well as increasing the demand for health services in the mining communities. This puts pressure on the limited services

provided by the various stakeholders<sup>3</sup> (Thomason & Rodney, 2009). Access to health services is also still limited for many people within the MICs because of a lack of transport and finances to pay for them (Johnson, 2011; McKay & Lepani, 2010; Thomason & Hancock, 2011).

The National Health Policy (NHP) statements do seek to encourage partnerships with the extractive industries (including multinational mining companies) to offer health services, but lack the capacity to effectively regulate health service delivery within these partnerships (McKay & Lepani, 2010; National Department of Health (NDoH) 2011-2020, 2010). Health service delivery within the mine-impact communities is an area where a lack of local plans and their effective implementation has severely impacted on the health status of the communities (McKay & Lepani, 2010; Thomason & Hancock, 2011). The Memorandums of Agreement (MoA) relating to the operation of the large-scale mines at the three mining communities in this study (Hidden Valley, Lihir and Misima) lack any mechanisms to give effect to the NHP. A study on Misima mine by Byford (n.d) further reveals that following its closure in 2004 the impacted communities today are faced with more negative impacts, especially for women, even more so than during the mine life. She states that the:

*overall situation for women is fraught with difficulties as there is little money, increased costs of goods and services, especially in health and education enabling infrastructure facilities, less transport, less opportunity to generate income and declining services (Byford, n.d., Paragraph 23).*

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<sup>3</sup> The stakeholders in the delivery of health services are: the Government of PNG (GoPNG), the Church, the mining companies and various other non-governmental organisations do provide some health services in the MICs in PNG (Thomason & Rodney, 2009; Thomason & Hancock, 2011).

This is significant as accessible and sustainable health services are strongly associated with the resilience of communities through, for example, contributing to a healthier and more productive population (Davies, 2011).

One critical element when considering the effects of large-scale mining on community resilience through health, is the recognition that different stages of mining will have different effects. In this sense there is a need to ensure the resilience (or sustainability) of health care delivery systems themselves. In order to further support and build the resilience of delivery of health services, other enabling infrastructure including better roads and power supply must also be developed and maintained. As such, this thesis also explores the contribution of other enabling infrastructure or services and outcomes in terms of health service delivery, and hence community resilience, in the mine-affected communities. The concept of Community Capitals (operationalized through the Bilum Framework) is used as a way of developing indicators to explore the effectiveness and efficiency of health care delivery and the contribution towards community resilience at different stages of mining. Figure 1.1 which follows summarises the main themes and causal linkages in this thesis.

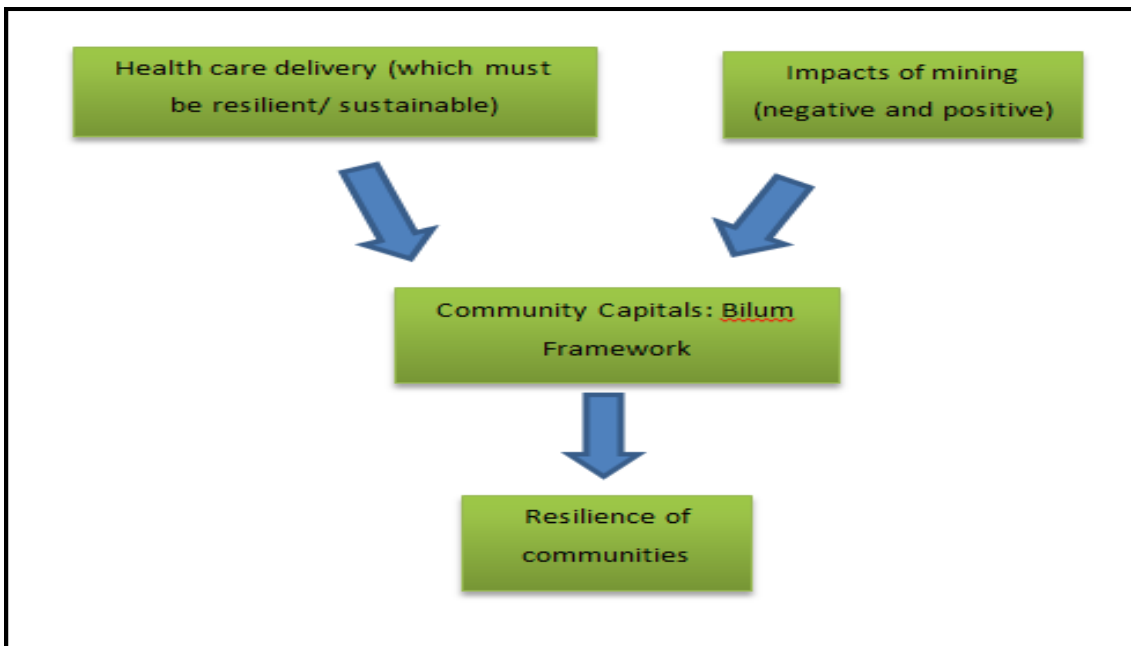


Figure 1.1: Main themes of the thesis.

## 1.5 Research aim and questions

The aim of this study is to explore the role that resilient health services can play in building resilience in mine impacted communities in Papua New Guinea. It intends to identify the challenges that prevent the delivery and/or maintenance of health services to these communities and seek alternative ways to overcome these barriers in mine-impacted communities. The research investigates the interface between the delivery of health services, the strength of various community capitals, and the building of community resilience. If health services can be improved or sustained through a combination of effective policy driven actions and community initiatives — community resilience should be improved, and this in turn will build stronger, more sustainable communities. This means these communities will continue to thrive long after the mine has gone.

Four primary research questions are formulated to guide this research.

**Question 1:**

*What is the link between Community Capitals, Community Resilience and the delivery of health services in mine-impacted communities?*

This first question attempts to establish the general relationship between community resilience, community capitals and the delivery of health services. It also intends to explore the relevant models of community resilience in the literature, and how policy applications in PNG can be connected to these models.

**Question 2:**

*What are the constraints or contributions (in terms of policy and/or implementation) surrounding the delivery of health services to these mining-impacted communities that prevent the building of community resilience?*

The second question intends to identify the achievements in and challenges to the delivery of health services and simultaneously, provide the basis for the development of alternatives to turn the situation around in MICs so the communities become more resilient.

**Question 3:**

*How can the contribution of health service delivery to community capitals and community resilience be monitored and assessed?*

The third question assesses the performance of the delivery of health services in the building of CR in MICs. This question intends to identify proxy indicators of community capitals that can be developed to provide insights into the ways in which community resilience is affected by health issues in communities impacted by large-scale mining. It does this through an analysis that seeks to demonstrate how the level of community resilience can be measured through proxy indicators linked to the community capitals.

**Question 4:**

*How does a Melanesian-centric 'Bilum Framework' approach to community capitals allow for greater understanding of the opportunities and challenges of building resilience through improved access to health services in mine-impacted communities?*

The fourth question focuses on the development of an indigenous 'Bilum Framework' approach to resilience and examines whether this allows for a greater contribution to the understanding of how to build resilience in the mine-affected communities. This analysis seeks to demonstrate that an approach based around the Bilum Framework will provide an opportunity for on-going improvements and strengthening of resilience in these communities. The purpose of this question is to find a way forward in building resilience through the delivery of health services in these communities.

## **1.6 The rationale and significance of the study**

While there has been a significant amount of valuable work on community resilience in the international context and a huge literature on the impact of mining in PNG (Banks, 2002; Filer, 2012; Gilberthorpe, 2013; Imbun, 2007; Jackson, 2002; Kepore & Imbun,

2011; Macintyre & Foale, 2004), there is limited literature that brings these together and examines resilience within mining communities in PNG. This study will assist policy makers to become more sensitive to key issues that are currently hindering the provision of relevant services including health within MICs, and hence assist in developing better policies to achieve resilience in mining communities. It will further seek to propose a Melanesian approach in the form of a Bilum Framework for understanding and building resilience in PNG's mine-impacted communities through the analysis and use of community capitals. The Bilum Framework developed will also contribute to the formulation of an alternative methodology to assess community resilience, and this in turn will contribute to the knowledge that can influence policy design so as to build resilience in mine-impacted communities.

## **1.7 The structure of the thesis**

This thesis comprises nine chapters in total. Following this introduction, chapter 2 describes PNG's health system including the formally established services regulated by the GoPNG and the traditional healing approaches which are still practiced widely, but are not coordinated by the GoPNG through its National Department of Health (NDoH). The chapter then provides an overview of the health status of the country with an emphasis on health indicators and the main health problems. The chapter also identifies those stakeholders responsible for the delivery of health services. In this chapter I create an understanding of the health care milieu and issues surrounding the delivery of health services and their use, as this is the context within which health care delivery and resilience in mine-impacted communities is to be examined.



Chapter 3 provides a critical introduction to mining in PNG. It outlines the economic importance of mining in PNG to establish an understanding of the impact of mineral wealth on the affected communities and the country as a whole. The chapter examines the relevant policy framework and the systems of governance of mineral wealth, along with a discussion of the impacts of mining benefits on the local communities. This sets the scene for the discussion that follows regarding how these benefits contribute towards achieving tangible improvements in people's lives and more resilient communities. Stakeholders who are connected to mining and benefits flows are also examined to determine their roles and responsibilities in the delivery of services such as health in these communities.

Chapter 4 presents an analytical framework for understanding the theories of resilience and community capitals. The chapter develops a definition of resilience by exploring the socio—ecological and social science views of the concept, although with more emphasis on the latter. The chapter explores the notion of levels of resilience that relate to the individual, the family and the community. These aspects of the social science view on resilience are linked to a Melanesian-focussed Community Capitals approach (the Bilum framework) and through this create an alternative avenue to measure the effects of mining on community resilience.

Chapter 5 presents the design of the study and discusses the methodology applied. It begins by recapping the research aim and the questions, followed by the methodological approach that flows from these. A discussion of the significance of the

selected case studies, and the qualitative and quantitative research methods employed, leads to the development of an alternative assessment methodology for community resilience. This alternative assessment methodology is applied in this study to measure the levels of resilience in the three impacted communities selected. This chapter also discusses other key issues such as the researcher's positionality and ethical issues relating to this study.

Chapters 6 and 7 present the findings for this study. Chapter 6 presents the findings from the survey questionnaire administered and presents data on the interviewees' levels of education, community engagement and their experiences regarding access to health services in the three communities. In addition, this chapter outlines the interviewees' perceptions of the strength of the various community capitals in their own community. Results from this chapter set the foundations for the measurement of community resilience through the use of the proxy indicators (see Chapter 8). Chapter 7 presents the findings from the qualitative research methods and pulls together the issues of policy alignment, the challenges surrounding community access to health facilities in the three case studies, and how these issues impact on the building of community resilience through the effects on the different community capitals.

Chapter 8 discusses the findings from the previous chapters in the context of the literature. Discussions include the lack of policy alignment and the impact this has on the health services. The chapter also uses the levels of resilience through the use of proxy indicators to analyse the community capitals for each community, and from this, the levels of resilience in these communities. The chapter further analyses the

measuring criteria and the overall CRI for each community's level of resilience in terms of its health services. Chapter 9 concludes this thesis, by returning to the research questions to better understand the implications of the findings for these communities and for understanding the effects of large-scale mining in PNG. It also includes some recommendations for further research and implementation of the proposed Bilum Framework for future research purposes.

## Chapter 2

### Health and health services in PNG

*“The overall health situation in Papua New Guinea remains a cause for concern” (Banks, et al., 2014, p. 42). Where there is strong economic growth, mainly through the revenue from mining (and other extractive industries), there is little evidence to show off for-access to basic health services in most rural areas is a challenge. Most people in the rural areas take on average eight hours or more to reach health services (NRI, 2010). Why are the majority of people vulnerable and non-resilient to preventable issues, such as, lack of road access and transport?*

#### 2.1 Introduction

PNG operates a unified health system where the Government takes the overall responsibility for the administration and regulation of these services through the National Department of Health (NDoH). It is the role of the NDoH to make policies, set standards and provide systems and procedures for delivering health services. They are guided in this by several Acts of Parliament including the Poisons and Dangerous Substances Act (1952); Disaster Management Act (1984); HIV Management and Prevention Act (1993), The Public Hospitals Act (1972), and The Organic Law on Provincial Governments and Local Level Government (OLPLLGs) (1995) which are all applied to the regulation of health services in the country. This study focuses on the delivery of health services at the district and ward levels and how these services contribute to the building of Community Resilience in terms of effectiveness, efficiency, sustainability and impact it has on the recipients. Campos-Outcalt, Kewa and Thomason (1995) and Thomason and Karel (1994) all argue that the emphasis

placed on decentralisation of responsibilities to the lower levels of government to provide effective and efficient health services has created adverse effects.

This chapter begins by introducing the two main paradigms of health and health care provision in PNG: traditional healing and the formal health system. Section 2.3 identifies and discusses the various stakeholders in the delivery of health services. The chapter then expands this discussion in section 2.4 by outlining the major diseases that contribute to the relatively poor health status noted in the introductory statement. This section also explores the indicators that confirm the poor status of health in the country. Section 2.5 examines the difficulties encountered in the provision of health services in the country, each of which contributes majorly to the poor health indicators and thus status of the population. The overall aim of this chapter is to create an understanding of the background to health and the delivery of health services in PNG, from which the thesis can then explore how and to what extent mining impacts on the delivery of these services and how they can contribute to the building of community resilience.

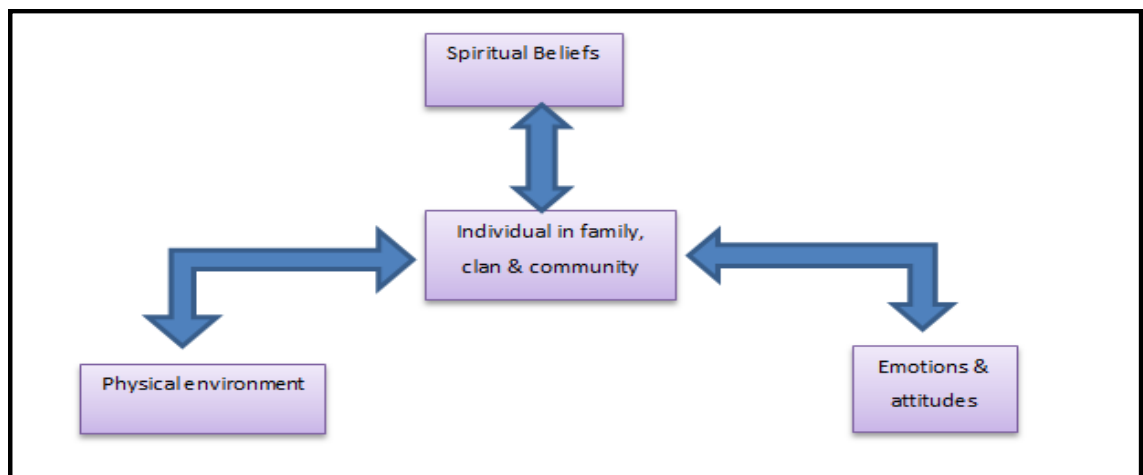
## **2.2 Approaches to health in PNG**

There are two main approaches to health in PNG which co-exist. The traditional approach to healing which involves indigenous healing models that are practised away from the hospital setting, while the western approach refers to the formal biomedical health system established by the colonisers (English, German and Australians) and now controlled by the Government of Papua New Guinea (GoPNG). Many people in Papua

New Guinea draw on both traditional approaches and Western medicines (Connell, 1997; Kipalan, Rongap, Ripa & Vince, 2012; Macfarlane & Alpers, 2009).

### 2.2.1 Traditional and informal approaches to healing

While the many communities in PNG have differing understandings and applications of traditional healing, there are also some commonalities. Typically an individual's health is integrally related to the community's emotional, physical and spiritual beliefs on health (Koka, Deane, Lyons & Lambert, 2014; Macfarlane & Alpers, 2009). Figure 2.1 demonstrates the factors that influence the approaches to traditional healing process in PNG.



**Figure 2.1: Traditional and informal healing approaches.**

Source: Developed from Connell (1997), Macfarlane & Alpers, (2009) and Macintyre, Foale, Bainton & Moktel (2005).

Papua New Guineans have different ways of conceptualising health and illness. They have different views on what can cause ill health and therefore how to respond to sickness. It is believed that a person's physical illness can be related to issues such as

deterioration in family welfare, conflict over land or other clan concerns. Physical illness may also be caused by doing wrong to another. In other words, illness is also analysed from “historical, social and cultural contexts” (Mayer, 1982, p.240) and can have a negative impact on the delivery of health treatment and ultimately a person’s health.

With respects to prophylactic or medicines traditional herbs are used to treat illnesses such as headaches, coughing, small sores, ulcers and other skin diseases. Kipalan, et al. (2012) note the use of specific herbs by parents or guardians to heal illnesses in their children. Parents or guardians of sick children use complementary and alternative medicine (CAM)<sup>4</sup> because they have the previous experience of seeing the recovery of sick children (Kipalan et al., 2012). Caregivers of children will use CAM prior to seeking formal medical assistance. Lastly, traditional beliefs and beliefs based on Christianity are also often applied to heal illnesses; Christian prayer, family and community reconciliation and locally prepared medicines are used to treat sickness concurrently (Kipalan, et al., 2012; Koka, et al., 2014).

The approach to healing and wellness promotion is context and circumstance specific. People choose according to their reasoning on the nature of illness but in many instances they combine elements of both traditional and formal health services. Therefore, a person’s illness will often become a family and community concern. The traditional practices for healing are still significant in the delivery of health services in

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<sup>4</sup> CAM is a collective term for complementary and alternative medicines and is understood to refer to traditional medicines. It is a widespread practice in PNG with limited studies on its significance (The Medical Society of Papua New Guinea, 2012, p.61).

PNG, because despite the use of biomedicines or the Western medical model, the indigenous “healing tradition has proven remarkably resilient” (Macintyre, et al., 2005 p.89) across PNG. This view is further supported by Macfarlane and Alpers’ (2009) study on the treatment seeking behaviour of the Nasioi people of the North Solomons Province.

Yet there is a lack of emphasis on the application of traditional health care practices by the Government of Papua New Guinea, although this has been addressed recently with an NHP on Traditional Medicine launched in 2007. Several studies on the use of traditional medicine (Bugni, et al., 2009; Rai & Maibani, 2012) in PNG illustrate the significance of indigenous approaches to treating illnesses among the local people. The significance of traditional medicine is not however noted in the NHP 2011-2020 and this omission is important in the context of this study, as traditional practices can potentially be significant because of the inconsistency in other forms of health provision in the context of extractive industries such as mining.

Although the applications of traditional herbs and their methods of applications are common across PNG, there is little evidence that the GoPNG places much emphasis on the implementation of their own policy on traditional medicine. This view is further supported by Connell who notes how the importance of “indigenous medical systems have increasingly given way to modern medical systems” (Connell, 1997, p.271).



Disregarding the use and management of traditional medicines could also reflect the Western approaches used by colonial policy makers that overlooked PNG's traditional health system. Romanucci-Ross explains that a society:

*based on kinship relationships provides a sharp contrasts to a society that functions primarily through political and economic institutions. In the United States groups pressuring public opinion regarding proper professional help in regaining health were instrumental in institutionalizing 'historical defeat', so to speak , of many alternative systems of health care so that allopathic medicine won the field (1986,p.1).*

This happened after the turn of the 19<sup>th</sup> century where strategic resources including political, social and economic structures were influenced by development processes (Romanucci-Ross, 1986). This view is further emphasised by Stephens, Porter, Nettleton and Willis, (2006, p. 2019) that the indigenous people's understandings of approaches to healing illness are often undermined by international goals including the Millennium Development Goals. Other authors (Bodeker & Kronenberg, 2002; Ngetich, 2008) also argue that indigenous healing approaches have been undermined by foreign or Western health systems. These processes can and have influenced the institutional structures that consequently impact the establishment of the health systems in former colonies like PNG. PNG like any other country in the world has its indigenous healing practices; employing foreign concepts and systems, and giving more emphasis and legitimacy to these can undermine the traditional approaches.

As Bebbington (2004, p.726) explains it is more or less immanent<sup>5</sup> that the interactions in the established structures influence “the expansion of capitalism”. It thus widens the gap between the haves and the have-nots. This provides a critique on why the majority of people, especially in the periphery of the country are confronted with challenges on the lack of accessibility to road and transport to health services. While Cowen and Shenton (1995) derive a slightly different view that many social ills of the society are unintentional consequences of capitalism and people do not mean to cause harm, unfortunately, the results turn out to be negative. Therefore, it is important to explore and conceptually understand different approaches to healing in both traditional and modern medicines and practices in the country.

## **2.2.2 The introduced health system in PNG**

PNG’s formal health system was introduced during colonisation, and now adapted by the GoPNG to serve its people. This system is underpinned by the Western biomedical model where health services are provided within formally established public and private health facilities. However, it is important to note that while hospitals for example, are underpinned by the above-mentioned model and thus have similarities they also differ within their cultural context of operation (Van Der Geest & Finkler, 2004). Hospitals and other health facilities such as health centres, sub health centres and aid posts are facilities whose operations are hence influenced by the cultural values and beliefs of the particular society within which they reside.

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<sup>5</sup> Immanent development refers to processes of structural, political economic change, such as the expansion of capitalism, while ‘intentional’ development is the stuff of international aid: public and other agencies implementing ‘development’ projects, programmes and policies with specific ends (Bebbington, 2004, p.726).

In PNG this formal system of health focuses on the physical symptoms of illnesses and on individuals with particular diseases. For example a patient with malaria is treated according to the diagnoses of this specific disease and through the administration of medication to alleviate the symptoms and ensure a rapid and complete elimination of the parasite from the patient's blood in order to prevent complication and or death. Biomedical research on diseases such as malaria (Aipit et al, 2014; Barry et al, 2012; Laman et al, 2014) and STIs (Viergever et al, 2014; Wardlow, 2014) is carried out to understand both the physiological and social impact of such diseases in the country. Results from these studies influence planning for solutions to better manage and treat these diseases.

In order to explore further the delivery of health services in PNG it is essential to examine the stakeholders who are involved. This will create a better understanding of the nature of health services in the country, and the challenges the systems face.

### **2.2.3 Stakeholders involved in the formal health services**

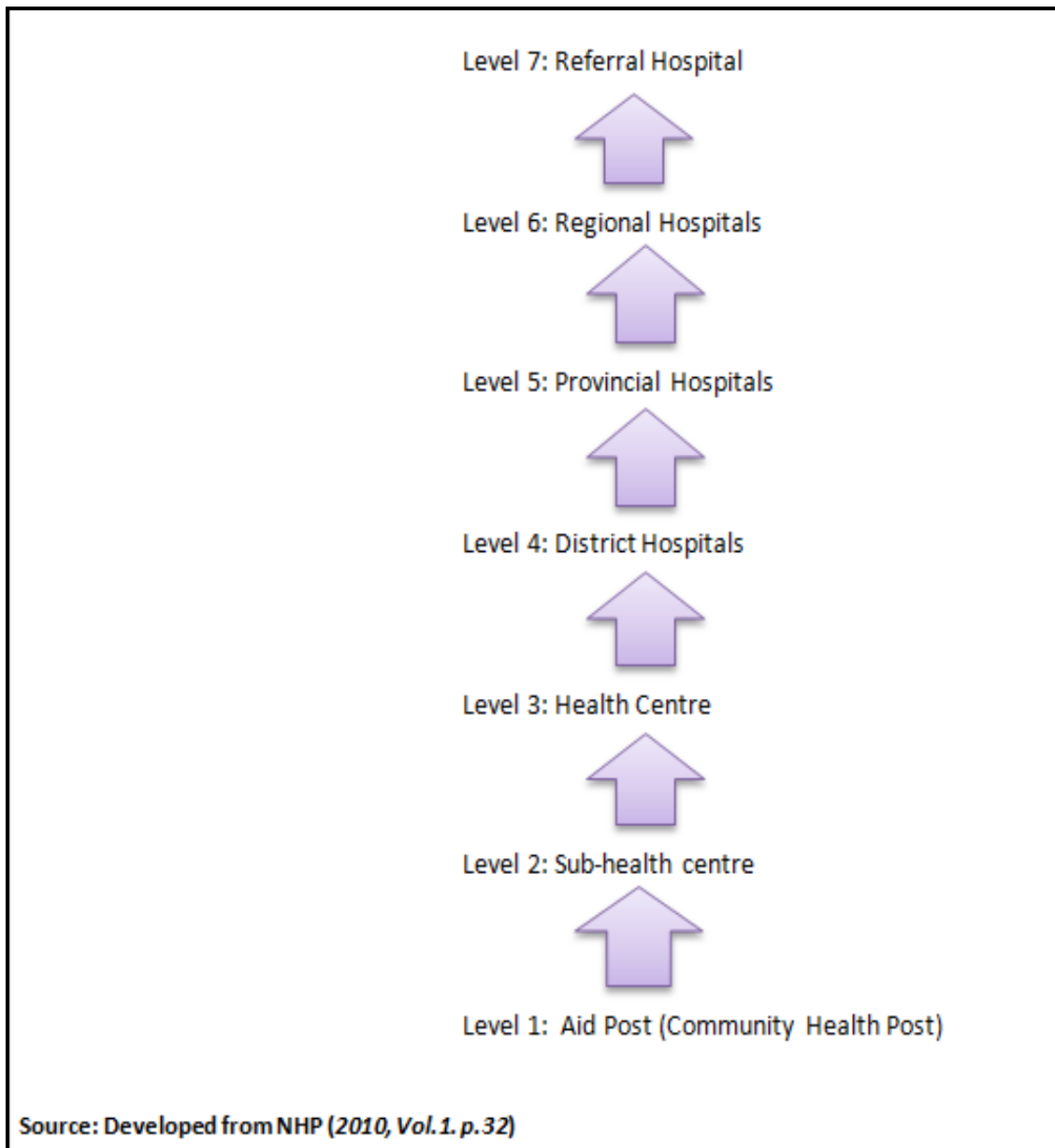
Connell (1997), Thomason and Hancock (2011) in their writings emphasised that there are two main stakeholders in the delivery of health services in PNG: the GoPNG, and the churches. Others involved in health care delivery include non-governmental organisations (NGOs) and private organisations such as mining companies who seek to provide services in the mining communities (see Chapter 3), and who are the focus of this research. In PNG, health services are largely funded, delivered and maintained by

the government with the churches delivering about 50% of these services in some outlying communities (Thomason & Hancock, 2011).

#### **2.2.4 The Government of Papua New Guinea**

The GoPNG has an established hierarchy of health facilities including provincial and district hospitals, health centres, sub-health centres and aid posts. In the periods just before and after independence, rural health services were prioritised and facilities established in the rural areas of the country. The first NHP in 1974 emphasised the expansion of health services across all parts of the country (Connell, 1997). The government thus worked in partnership with the Church and other stakeholders who were providing almost 50% of the rural health facilities, primarily health centres and aid posts (Thomason & Hancock, 2011).

The health services in the country are delivered through the hierarchy of facilities from level 1, the village aid post ranked at the lowest level (which are being renamed as Community Health Posts (CHPs), to level 7, a referral hospital ranked at the highest level which is in the capital, Port Moresby (see Figure 2.2). The health facilities or hospitals from levels 5 to 6 cater for the provinces with one provincial hospital positioned as the regional hospital. It is a 'bottom-up' system where service delivery starts within the community and moves up to the referral hospital, depending on the severity of the patients' condition. The focus of this study is on the lowest four levels of facilities and services they provide: aid post, sub health centre, health centre and district hospitals, all of which are present in the mine-affected communities.



**Figure 2.2: Health service delivery and referral process.**

The level 1 aid posts make up 70% of the health facilities in the country and are designed to cater for a population of 1,000 people within their specific locations, although in practice 23% of these facilities are now closed (NDoH, 2010; WHO & NDoH, 2012). Aid Posts are manned by community health workers with a minimum of two years training who provide basic health care services including mother-child care and community-based health promotion (WHO & NDoH, 2012).

The next levels, sub-health centres at level 2 and health centres at level 3, provide the same level of services although the sub-health centres are smaller and usually run by different church groups. These facilities manage chronic and acute conditions as well as providing basic surgical care, and maternal and children health. These facilities provide for about 5,000 to 20,000 people within the proximity of their location. The district or rural hospitals at level 4 deliver all the services provided by the lower levels of health services and are designed to cover a population of between 40, 000 to 300, 000 people (NDoH, 2010; WHO & NDoH , 2012).

Each of these levels deals with patients receiving referrals for more serious illnesses from the community aid posts and health centres. All levels of the health services are regulated by the National Health Administration Act (1997) of the GoPNG.

Levels 1 to 7 are formally established services within the GoPNG system, supported in some instances by churches and various NGOs. In some communities, including the mine-impacted communities, private companies/employers will also offer access to various health services. The services offered by the private sector facilities include those that are both preventative and clinical in nature. Preventative health care programmes include Maternal Health Care (MHC) and Maternal Child Health (MCH) programmes (Byrne & Morgan, 2011; Hermer, 2005). Specialist clinicians in these larger and often private facilities focus on specific illnesses such as malaria, HIV/AIDS and diabetes.

## 2.2.5 The Church

The Church<sup>6</sup> in PNG has been a major partner with the GoPNG in the delivery of health services in the period prior to and after independence, using funding largely provided by the State. It has established health services in both rural and urban communities of PNG (Connell, 1997; Thomason & Hancock, 2011), and especially provides those facilities at levels 2 to 5. In the 1970s, it was the Church which provided health services to almost 50 per cent of the rural population, with remote mission stations providing the only source of formal health care to these communities (Connell, 1997). In 1991 it was still recorded that the churches managed almost “half of all the rural health facilities and employ 16% of all health workers in the country” (Thomason & Kolehmainen-Aitken, 1991, p.159). This point highlights also the low percentage of staffing in rural areas as a point of first contact with the health service. The Church continues to be an active partner in delivering health services in PNG even today (Thomason & Hancock, 2011).

Despite their presence according to Ascroft, Sweeney, Semos and Morgan (2011), the partnerships between the Church and the GoPNG have been described as weak (Clarke, 2011). A lack of effective approaches to building active partnerships between the GoPNG and Church has also resulted in negative impacts on the delivery of Public Health Care (PHC) services. These detrimental impacts such as lack of collaboration are

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<sup>6</sup> The Church in this study refers to the Christian Religion and other Faith Based Organisations (FBOs) that provide health services in the MICs in PNG. In practical terms, it refers to the Catholic, Lutheran, Methodist, and Seventh Day Adventist Churches who contribute to the delivery of health services in PNG.

argued to have contributed unfavourably to a lower health status for the population of Papua New Guinea.

## 2.3 Status of health

The poor status of health in PNG has been a topic of discussion amongst GoPNG, International agencies such as World Health Organisation (WHO), World Bank (WB), the Asian Development Bank (ADB), other non-governmental organisations (NGOs), and academics for well over a decade. The overall health status of PNG is a concern as the country's strong economic growth has not translated to improve the health of its people (Banks, et al., 2014).

The following sections discuss the status of some major diseases in Papua New Guinea, most of which are present within the communities that are the focus of this thesis. Literature on curable but prevalent diseases such as malaria, tuberculosis (TB), cholera, Non Treated Diseases, and Sexually Transmitted Infections demonstrates that there are worrying trends in both rural and urban settings with more serious implications noted in the rural and peri-urban environments such as squatters' settlements (Banks, et al., 2014; Mola & Kirby, 2013; NDoH, 2013). There is a clear link between provision of health care and the prevention and treatment of disease and illness such as those listed above. These preventable and treatable diseases will now be discussed.

Although overall the incidence of malaria has declined markedly in the 2008-2012 period (18.2%-6.7% population parasite prevalence), it has become endemic in every



province, including the Highlands Region, which was once considered malaria-free (Ingram, Crenna-Darusallam, Soebianto, Noviyanti & Baird, 2014; WHO, 2011). It constitutes a significant burden on the health system. Malaria is difficult to eradicate (NDoH, 2010) despite the decline in reported cases from 2008-2012 (WHO; 2012). Despite the apparent decline in malaria, it is in fact more widely prevalent as it has become endemic across the country and as such preventative programmes must work across a wider area in order to control the spread of the disease. The co-existence of plasmodium species can cause severe consequences such as adding to morbidity and mortality rates (Genton et al., 2008).

Simultaneously, TB is also another sickness which is of increasing concern as people with this disease occupy 13% of the hospital beds (NDoH, 2010), and TB patients have a high death rate. PNG ranks second in “estimated TB burden in the Western Pacific Region” (WHO as cited in Banks, et al., 2014, p. 43). Despite the GoPNG’s efforts to control this disease, it remains a burden. Results from several studies further confirmed that TB is wide spread and continues to increase (Hermer, 2005; NDoH, 2010; Banks, et al., 2014).

Furthermore, cholera is found in unhealthy environments with poor sanitation facilities (Horwood & Green, 2012). Cholera outbreaks along the northern coast since 2009 are a result of poor sanitation and environments such as the outskirts of the cities and rural areas in Papua New Guinea (Horwood & Greenhill, 2012; Horwood, et al., 2014). The spread of this disease is difficult to control due to overcrowding in these locations. The treatment of cholera is further complicated by the rugged terrain and limited

infrastructural developments, making it hard for health care workers to access, notwithstanding the fact there is lack of health resources in these areas anyway.

Leprosy and STIs are also major issues. Leprosy is endemic and occurs in mainland areas including the coastal inland and the highlands. Health programmes for leprosy fell away after it was thought to be under control in 2000 (AusPostalHistory.com, n.d). Leprosy re-emerged and is now widespread with new cases still being diagnosed at the end of 2013, children under the age of 15 feature significantly (Banks, et al., 2014). Regarding STIs their prevalence is very high in comparison to global and regional standards (Banks, et al., 2014). With reference to congenital syphilis, a study undertaken at the Goroka Base Hospital by Frank and Duke (2000) highlights that STIs are contributing to neo-natal deaths, although the definite percentage of the neonatal and infant deaths related to STIs is unclear.

Papua New Guinea's first HIV/AIDS case was reported in 1987, and since then has been declared to be of epidemic proportion due to the high prevalence rate (Suwamaru, 2012). The figures on the issue have been staggering as different studies revealed its status in the country (Kelly-Hanku et al., 2013; Koczberski, 2000; McBride, 2005). The NDoH indicated that since 2005 about 60% of the new cases are females. Studies on the issue have pointed out its negative impacts on the overall development of PNG. Although recent studies show a slight decline in the adult infection rate (Man et al., 2013) the issue continues to be a challenge not only as a health problem but also as a socio-cultural issue (Koczberski, 2000; Tynan et al., 2013), and it is also argued to be explicitly linked to gender-based violence (Lamprell, Greenfield & Braithwaite, 2014;

Walker, 2014). For a country that is confronted with serious health issues including ineffective recording of disease statistics it is difficult to determine the exact number of people living with HIV (Banks, 2010). The high infection rate resulting in HIV related deaths contributes to the low indicators through child mortality (NDoH, 2010). The status of health in PNG is also illustrated by a range of other health indicators.

### 2.3.1 Health indicators

Basic health indicators used by the GoPNG (NDoH), including the Maternal Mortality Rate (MMR), Infant Mortality Rate (IMR), and Under 5 Mortality Rate, further demonstrate the poor status and the level of health of the population and provide pointers to the performance of health services in PNG (NDoH, 2010). The following paragraphs demonstrate what these indicators can tell us about the status of health in the country.

The estimation of the Maternal Mortality Rate in PNG exemplifies the overall trend in the difficulties associated with pregnancy in Papua New Guinea. Table 2.1 outlines the rates of the selected indicators to display the MMR.

**Table 2.1: Selected women and Child Health Indicators.**

Rates	Years		
	1996	2006	2010
<b>Maternal Mortality (MMR) (deaths per 100,000 births)</b>	370	733	230
<b>Infant Mortality (IMR) (deaths per 100,000)</b>	69	59	33
<b>Under 5 Mortality (deaths per 100,000)</b>	93	75	48

Source: NDoH (2010, pp. 98-99).

The MMR in PNG is the “second-highest in the Asia-Pacific region and high in comparison globally” (NDoH, 2010, p.99). These indicators are said to have worsened over the last decade, although officially the MMR has declined from the very high 2006 figure. These figures are reflective of poor access and availability of health services because these deaths are entirely preventable.

The figures in Table 2.1 appear to show that the MMR has improved between the years 2006 to 2010; however these figures have been queried. Several international sources give estimations that are different from the national figures on the MMR. Mola and Kirby (2013) argue that these inconsistencies cause confusion for the NDoH and its partners. The analysis by the above authors, Mola and Kirby (2013), on the MMR clearly demonstrates the source of these discrepancies (different estimation techniques and models) in techniques used to work out estimates of the MMR lead to different figures (based on hospital records for a 5 year period) and that a figure of around 500 deaths per 100,000 births is likely to be more accurate (NDoH, 2010). Studies also reveal significant variations in different regions of the country, and correlations are made with factors such as literacy, and infrastructure (see Section 2.4). The high incidence of these common diseases and their mortality rates are the result of inefficiencies such as lack of resources, staff shortage and properly trained health staff, as well as access and a lack of infrastructure to support the affected populations (Banks, et al., 2014; NDoH, 2010). The high prevalence of these diseases is thus obviously related to an overall lack of resource input which in turn hampers the effective implementation of health programmes. This is one of several major

challenges that the health system faces in Papua New Guinea which is explored further below.

The IMR and the Under-Five child mortality also remain high and present a challenge to authorities as the child mortality rate in PNG is high in comparison to other countries in the Pacific region, despite a slow decline in recent years (NDoH, 2010). NDoH (2010) figures show child mortality rates declined by 20% from 1996-2006. Literature on the IMR and the Under-Five child mortality in Papua New Guinea demonstrate that the main causes of child mortality are preventable diseases such as STIs, IMR, pneumonia and diarrheal illnesses (Banks, et al., 2014; Frank & Duke, 2000; NDoH, 2010). The perpetual question here is — why do children die from preventable and/or treatable diseases or illnesses? The answer appears to be that there are other issues such as poverty and poor access to roads and thus health care facilities, for example that have a negative impact on the overall well-being of communities (Gibson & Rozelle, 2003).

## **2.4 Challenges to the delivery of health services in PNG**

The delivery of health services and therefore health care in Papua New Guinea is situated within an environment which is complex and full of challenges: from ad-hoc or low funding to ineffective governance, poor infrastructure and lack of trained personnel, among others. Four major issues of particular relevance to this research on mining-affected communities are noted in the literature (NDoH, 2010): the decentralisation of the health system (including ineffective coordination of services);

staff shortages and poor or lack of staff training; a lack of resources; and limited transport and road links to enable access to health care facilities. These issues are analysed to outline how they contribute to both the low health status of the population, and how simultaneously the various factors can detract from the building of community resilience

### **2.4.1 Decentralisation**

Many of the difficulties associated with the delivery of health and other services in PNG originate from the decentralisation<sup>7</sup> of powers from the national government to lower levels of government, specifically the Provincial (PGs) and the Local Level (LLGs) administrations (Campos-Outcalt, et al., 1995; Feeny, 2013; Thomason & Karel, 1994). This decentralisation is significant to the thesis as it provides the context in which the constraints on the delivery of health services to the mine-affected communities occur. Three distinct phases of decentralisation have taken place in the country (Guoy, 2009 as cited by Feeny, 2013); the analysis in this section will be done according to the three phases of decentralisation.

The first phase was introduced in 1977 after independence and stayed in place until 1995. In 1977, a range of powers were delegated mainly to the Provincial Governments (PGs), and were based on “perceptions of their management capacities” (Feeney, 2013, p. 73). The decentralisation of responsibilities in health services primarily occurred later in 1983 (Thomason, Mulou & Bass, 1994). This decentralisation

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<sup>7</sup>. Decentralization is the degree to which powers have been devolved to regional entities in the different policy areas (Falco-Gimeno, 2012).

appears to have negatively impacted on service delivery (Standish, 1983; Thomason & Karel, 1994). The post-decentralisation effects are linked to the planning approaches adopted and Thomason et al., (1994, p.14) identifies some of the key issues as:

- (i) *insufficient political and district participation;*
- (ii) *poor planning capabilities in the districts to develop their own operational plans;*
- (iii) *financing mechanisms that gave the (NDoH) no means to influence district resource distribution; and,*
- (iv) *inadequate arrangements for monitoring and evaluation.*

The GoPNG, in an attempt to rectify the problems created by the first round of decentralisation, embarked on the second phase in 1995 by introducing the Organic Law on Provincial and Local Level Governments (OLPLLG). This law delegated greater powers to the PGs and LLGs. Several authors (Guoy, 2009; Thomason & Kase, 2009) have criticised the second phase of decentralisation, basing their arguments on issues such as the size of grants which were allocated to the Provincial level being fiscally unsustainable. Further negative effects, such as on the delivery of primary health care after the 1995 reforms have been recorded (Campos-Outcalt, Kewa & Thomason, 1995; Frank & Duke, 2000), and overall the changes in the OLPLLG showed little positive impact on the delivery of health services. Campos-Outcalt, Kewa and Thomason (1995, p.1091) revealed that the administration of health services in the Western Highlands Province faced challenges including:

*lack of qualifications of District Assistant Secretaries, a diversion of funds to other programmes, unavailability of transportation, a lack of equity in personnel between districts and a lack of adequate professional supervision. The problems which developed in this attempt at further decentralization related to a lack of professional support and oversight of health professionals, a lack of role definition for provincial and district*

*administrators, lack of management training for district officials, inadequate oversight by local elected officials and inadequate budgets.*

The OLPLLG was put in place despite opposition from national health officials (Campos-Outcalt, Kewa, & Thomason, 1995). Recent literature (Valley, et al., 2013) confirms the persistence of many of these issues including lack of transport in many parts of PNG. A recent study by Joshua, Passmore, Parsons and Sunderland (2014) also notes that the lack of supervision on drug prescriptions is a problem in parts of PNG. In other words, some health workers overlook some important processes such as revising available facts before prescribing medications. These issues were identified as contributing factors and as obstacles to the smooth devolution of powers for the delivery of health services in the WHP.

The third and most recent phase of decentralisation was introduced in 2009. This phase aimed to improve financial accountability, as “grants to PGs (are) divided into six conditional service delivery grants to be spent on the recurrent costs for agriculture, education, health, transport, village courts as well as administration” (Feeny, 2013, p.73). However, literature on the delivery of PHC from 2009 onwards reveals still further deterioration in service delivery and health outcomes. The NDoH (2010) for example, explicitly outlines low health indicators and link these to service delivery issues. More recent literature including Feeny (2013), Bauze et al (2012) and WHO (2014), also describes and analyses the problems encountered in the delivery of health services, and the links to high mortality rates.



Taken together, there appears little doubt that the three phases of the decentralisation process that began right after independence have had negative impacts on the delivery of health services — the opposite of what was intended. The reasons for this are complex, however overall health and other services did not become more accessible to the majority of the people especially in the rural areas of PNG.

Other literature on decentralization and Public Sector Reform (Esonu & Kavanamur, 2011; Standish, 1983; Turner & Kavanamur, 2009) explicitly supports the work of Campos-Outcalt and others (1995) who argued that there were problems with coordination impacting the delivery of services such as health in PNG. The difficulties in the coordination and the management approaches to the decentralisation of responsibilities from the national government to the provincial and local level governments are thus well documented (Kolehmainen-Aitken, 1992; Pincock, 2006). Decentralisation without proper planning and preparation (such as training in staff capacity to implement the decentralisation process) produced few tangible results in terms of the effective and efficient delivery of health services (Thomason & Karel, 1994). More recent studies on the delivery of health services in PNG also emphasise poor service delivery related to the coordination of resources through the current channels (National, Provincial and LLG) (Filer, 2004; Pincock, 2006), demonstrating that little progress is being made.

There is a lack of effective management in the overall operations of the health facilities especially at the district level of government. Campos-Outcalt, Kewa, and Thomason

(1995) focussed on decentralization and administration of health services at the subdistrict level, and revealed some staggering results. Their interviews demonstrated difficulties such as a lack of finances, a lack of transport to do health runs, and limited professional support. Recent work by Howes, et al. (2014) confirms the financial difficulties encountered in the delivery of health services in PNG. The interviewees in this study also felt that District Assistant Secretaries had limited health training. Those responsible for the provincial and district level were ill prepared to take up responsibilities to manage the huge sums of money provided to deliver services to the local communities. These results confirmed the work of Campos-Outcalt, Kewa and Thomason (1995) on the consequences of decentralization of health services in the Western Highlands Province in PNG that showed inadequate budgets for health services. Several other studies on the impact of decentralizing health services in PNG (Kolehmainen-Aitken, 1992; Thomason, Mallow & Bass, 1994; Thomason, Newbrander & Kolehmainen-Aitken, 1991) have shown similar results. There are more negative impacts than positive ones in terms of the decentralization on the overall delivery of health services.

The decentralisation process has also been seen to be politically motivated to free-up decision making of political actors at the provincial and district levels of government. So while, the decentralization of health services sought to bring power closer to the people enabling them to make their own decisions with respects to health issues as these affected their lives (Standish, 1983), the intention was not realised. The issue is not so much with the decentralization process, however, because it has produced some good results in health services in other parts of the world. In Colombia, for

example, fiscal decentralisation allowed the local authorities to control the expenditure on health services, consequently leading to an improvement in their IMR (Soto, Farfan & Lorant, 2012). This has not been the case in Papua New Guinea.

## 2.4.2 Staff shortage and lack of training

The PNG NDoH suffers from a shortage of staff to provide health services to populations in rural outlying areas. Staff shortages and a lack of training of health workers are major concerns affecting the effective and efficient delivery of health services in the country. These issues have affected the quality of health services provided throughout the country by the GoPNG and the Churches (Au, Hollingsworth & Spinks, 2014). The scarcity of health workers showed that in PNG, as “health workers are scarce, health services and health outcomes suffer” (Hendersen & Tulloch, 2008, p.2). Table 2.2 highlights the staffing within the Health system by designation across the health facilities in the country.

**Table 2.2: Designation of staff (per 10, 000 population).**

Designation of staff	Number of staff by designation in hospitals (%)	Number of staff in health centres, sub centres and aid posts (%)	Total (%)	Health workers per 10,000 population
<b>Medical officers</b>	326 (83.2 )	66 (16.8)	392 (3)	0.6
<b>Health extension officers</b>	87 (19.2)	365 (80.8)	452 (3.5)	0.6
<b>Nurses</b>	1,622 (42.9)	2,155 (57.1)	3,777 (29.3)	5.3
<b>CHWs</b>	1,093 (24.6)	3,356 (75.4)	4,449 (34.5)	6.3
<b>Dental officers</b>	69 (56.1)	54 (43.9)	123 (1)	0.2
<b>Other allied health workers</b>	2,032 (54.9)	1,672 (45.1)	3,704 (28.7)	5.2
<b>Total</b>	<b>5,229 (40.5)</b>	<b>7,668 (59.5)</b>	<b>12,897</b>	<b>18.3</b>

Source: Adapted from WHO & NDoH (2012, p.6).

The small number of health workers per 10, 000 population is very low. A recent study relating to health workers in the Pacific Islands points out that the number of nurses per 10, 000 populations for PNG (see Table 2.2) is the lowest in the Pacific (Asante, Negin, Hall, Dewdney & Zwi, 2012). These figures illuminate the skeleton levels of staff in the health facilities and as mentioned before is of serious concern for the GoPNG. Moreover, staff shortages put a burden on those available staffs' workload as well as leading to the closure of some health facilities especially aid posts in the peripheral areas in PNG. Recent literature by Worth et al. (2012) and Asante et al. (2012) on health workers confirmed the continuing problem of staff shortage in PNG.

According to recent statistics PNG faces a shortage of health workers. As presented by WHO & NDoH, there are "low numbers of health professionals per head of population: 5.3 nurses/midwives and less than 1 doctor per 10,000 people" (2012, p.5). Considering the total population of the country (7.2 million) the limited number of health workers is of serious concern. A recent study by the National Research Institute (NRI, 2010) further confirms that the ratio of health workers to the population is overwhelmingly low. The NDoH (2010) itself acknowledges that in some provinces there are no doctors available. According to The World Bank (2010) as cited by Banks, et al., (2014, p. 46) there is "one doctor per 17, 512 people, five nurses per 10, 000 population, and seven Community Health Workers (CHWs) per 10, 000 population". Recently WHO and NDoH (2012) reported that a staggering 776 (23%) of aid posts were closed due to staff shortages and other difficulties. These analyses illustrate the

critical deficit of staffing within the PNG health services. This provides an important part of the context within which the contribution of a large-scale mine can make to rural communities in PNG.

A lack of training among staff in health facilities is also a cause for concern. Aid posts manned by community health workers are responsible for “health promotion, antenatal and postnatal care” (Banks, 2010, p.12), in addition to general patient care. These CHWs lack proper training in dealing with serious cases including maternal health. This contributes to the high Maternal and Infant Mortality Rates in rural areas. Some of these health workers are incapable of “performing even simple pathology and other investigations for patients with life-threatening and indeed fatal conditions” (Sanga, Costa & Mola, 2010, p.23). The CHWs are often burdened with huge workloads due to being in the frontline in dealing with over 80% of the country’s population in the rural areas. Aid posts are the first point of entry into the health system and ideally require CHWs to accurately refer patients needing more specialised treatment to higher level facilities. The low levels of expertise and training among health workers is a factor that impacts on health outcomes and hence detracts from the building of CR in rural communities, including the mine-impacted ones that are the focus of this thesis.

### **2.4.3 Lack of resources**

A lack of resources in the health system is another major issue contributing to the difficulties surrounding the effective and efficient delivery of these services. A lack of resources affects the health facilities’ ability to provide high quality care to the patients

and creates difficulties in the smooth delivery of services. A study by Toikilik et al. (2010) revealed firstly a lack of transportation to be an obstacle for mothers bringing their children to even the closest health facility for immunisation. This becomes even more problematic when they arrive to find the medicines and/or instruments required for immunisation are not available (NDoH, 2010; Sanga, et al., 2010). Other studies on difficulties in accessing health services in PNG also highlight the lack of drugs, staff shortages and transport issues to be widespread (Henderson & Tulloch, 2008; Holmberg, et al., 2014; Sweeney & Mulou, 2012). The work of Campos-Outcalt, Kewa and Thomason (1995) on the consequences of decentralization of health services in the Western Highlands Province in PNG showed there was an inadequate budget for health services. More recently McNee (2012) confirms the widespread challenges creating delays in the delivery of drugs in Papua New Guinea, a finding confirmed by the surveys of Howes et al (2014). On the other hand, recently there have been increases in the funding of both GoPNG and Church run health facilities in the country. The NDoH (2010) illustrated an increase in the recurrent health expenditure from 2007-2010. This trend is confirmed by the NDoH (2013) Sector Performance Annual Review (2013). This could imply the lack of focus on support services such as road linkages, as well as the lack of capacity to effectively translate more money into better services (Banks, et al., 2014).

#### **2.4.4 Road links, transport and access**

Road links and transport play vital roles in enabling accessibility to health services (Kenyon, Lyons & Rafferty, 2002). The lack of accessibility of health services in rural

areas, including the MICs, presents a serious challenge. Thomason and Hancock (2011) emphasize the importance of enabling infrastructure as the lack of it leads to many obstacles in terms of accessing health facilities in most rural settings. Poor access to health services due to their distance and road linkages and a lack of transport from villages result in low-levels of usage (Muller, Smith, Mellor, Rare, & Genton, 1998; Noor, et al., 2006; Thomason & Hancock, 2011). People who live further away from the health facilities have greater difficulty in accessing these services. Studies elsewhere (Kenya) and in PNG (Muller, et al, 1998; Noor, et al., 2006) on the effect of distance and use of health services confirm the importance of enabling infrastructure (such as roads) that facilitates community members accessing the available health services. A study by Arcury, Preisser, Gesler, and Powers (2005) highlighted the impact of transport and accessibility to health services and the importance of improving transport services so as to provide better access in health services. Lack of road linkages and transport does have a negative impact on the access of community members to required health services, and hence detracts from the building of community resilience. In PNG, the poor level of infrastructure causes difficulties in access and continues to contribute to the challenge of ensuring equity in accessibility of health services (James, Nadaraja, Haive & Stead, 2012). According to Ningal, Hartemink, and Bregt (2008) this particular trend has worsened in recent years, partly as a result of the increasing population.

Literature on people's access to health and other services in PNG highlights how the hardships encountered by the majority of the people in accessing these services (Gibson & Rozelle, 2003; Pincock, 2006) are linked to factors such as such as the rugged terrain, lack of road links and poor sanitation. The NRI District and Provincial

Profiles, an ongoing project that provides social and economic indicators in PNG, points to the lack of support facilities such as road access in the rural areas that prevents the people from accessing facilities, including health facilities (NRI, 2010). Alongside road access, other support services such as power supply, sanitation facilities and telecommunications can also play an important role in assisting with access to effective health services and therefore can contribute towards the building of community resilience.

## 2.5 Conclusion

This chapter reviewed the current state of health and health services in PNG, providing the context for the later chapters of this thesis. The chapter traced the background to understandings of health in terms of both indigenous and introduced systems of healing that continue to co-exist today. The indigenous methods are regarded as informal and given less emphasis by the GoPNG while the Western approaches to health care shape the formal health system. The latter is the focus of most of the state and corporate approaches to health delivery in the mine-impacted communities in Papua New Guinea, and hence the central element of this research into the 'building of community resilience through the delivery of health services.

The two main agencies in the delivery of health services are the GoPNG and the Church. These two stakeholders provide the vast majority of the health services while other minor stakeholders include NGOs and the private sector (including mining companies). The GoPNG is responsible for the administrative regulations that other



stakeholders must abide by. Health workers and patients alike encounter difficulties with the delivery of health services. The literature confirms health services in PNG fail to deliver adequate services to the bulk of the rural population, and as a consequence many of the indicators of health are poor. These indicators show daunting challenges; including very high IMR, MMR, and Under-Five MR. The high mortality rates are connected with and indicative of the overall health service problems faced by the country, including inappropriate levels of decentralisation of services, a lack of trained personnel, a lack of resources (although these have increased at the national level in recent years), and problems with access to the existing facilities. All of these issues are present, to varying degrees, in the health services available to the mine-impacted communities that are the focus of this research.

The next chapter moves on to describe the mining industry in PNG to understand the pathways by which the mineral wealth of the country can potentially be translated into tangible health services and outcomes that in turn will contribute to more resilient and sustainable communities, even if this is not the outcome to date.

## Chapter 3

# Mining in Papua New Guinea

### 3.1 Introduction

Papua New Guinea is highly dependent on the extractive sector. The country relies heavily on the revenues from its resources for economic growth and government revenue. More broadly, the mining sector in PNG plays a significant role in the country's overall development. The mining companies operating in different communities across the country bring enormous change to these locations that are established in some of the world's most isolated areas. Some people would associate the high revenue generated from mineral resource with positive growth for PNG, but many are pessimistic about the 'boom-bust' nature of mining operations. The impact that mineral wealth distribution and overall development has on the impacted communities and the country as a whole is contested by many. This chapter introduces the context of mining in PNG to provide background to the ways in which the industry at the local-level contributes (or otherwise) to community resilience among communities impacted by the large-scale mines.

The focus of this chapter shifts from the broad (national-level) down to the specifics of health and impacts on local-level communities. This chapter firstly explores the significance of mining in PNG's economy, then covers policy and governance issues surrounding the mining industry and the impact of mineral wealth on the host communities. The various stakeholders involved in the sector are then introduced,

with a focus on the role they play, and the responsibilities they have in maintaining and building resilience within the communities. This chapter further investigates how mineral wealth trickles down to the adjoining communities, and how these benefit streams contribute (or not) to the building of resilience to help achieve sustainable communities. While this is not a thesis focussed on economic aspects of the mining industry, the revenue streams are critical to understanding community change and the prospects for strengthening resilience. The chapter then reviews two particularly relevant impacts of mining at the local level (land and effects on women), and then concludes with a discussion of the links between these large-scale mines and health in the affected communities.

### **3.1.1 Papua New Guinea and the economic importance of mining**

Mining began in PNG in 1888 when a significant amount of gold was discovered at Sudest Island, in Milne Bay, bringing miners north from the goldfields of Queensland. This discovery led the way for further exploration across the islands and eventually developed into hard rock and large-scale dredging operations at Wau and Bulolo on mainland Papua New Guinea (Nelson, 1976). The modern era for mining started in the 1970s when the Bougainville Copper Mine (BCL) was established. BCL had a successful operation from 1972 to 1988 and contributed about 17 per cent of the country's revenue (Banks, et al., 2014), but was forcefully closed down in 1989 due to landowner grievances and environmental impacts (Filer, 1990). From the 1980s several other mines have been established around the country. Currently the country hosts eight operational mines: Lihir, Hidden Valley, Ok Tedi, Porgera, Ramu Nickel, Simberi, Sinivit

and Tolukuma. Solwara 1, the world’s first deep-sea mining operation, is now under construction. Most of these mines produce gold, while Ok Tedi is also a copper producer and Ramu Nickel produces Nickel and Cobalt (Banks, et al., 2014). Figure 3.1 shows the location of the current and potential future mines in the country.

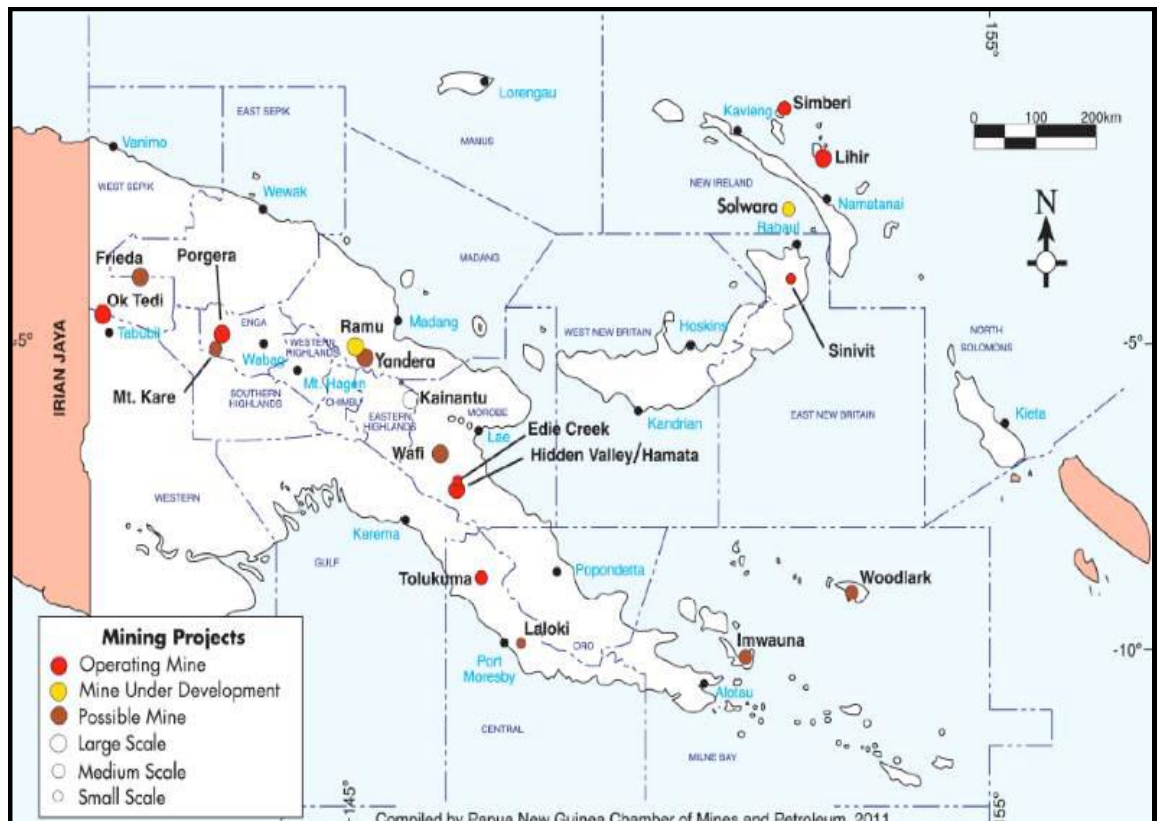


Figure 3.1: Current mines and future prospects for mining in PNG.

Source: PNG Chamber of Mining and Petroleum.

These mines contribute significantly to the country’s economy by generating revenue from taxes, from dividends from equity shareholding in the operations, and through a 2 per cent royalty to the GoPNG. Recent figures on mining revenue to PNG confirm that over 50 per cent of the foreign income is from mineral exports (BPNG, 2011, 2012, 2013). These figures illustrate a typical ‘extractive resource dependent’ economy and

are predicted to continue for some decades or so. Table 3.1 highlight the production and mine life estimates of the five major current mines in the country.

**Table 3.3: Mining operations and resource production.**

Mine	Resource extracted	Production	Approx. value of production (2013 values) (USD)	Mine life ( <i>actual and anticipated</i> )
Ok Tedi	Gold and Copper	125,000t Cu 405,000oz Au (2012)	\$1,504 million	1984-2023
Porgera	Gold	507, 000oz Au (2013)	\$700 million	1992-2023
Lihir	Gold	650,000oz (2013)	\$900 million	1997-2035
Hidden Valley	Gold	200,000oz (2011)	\$280 million	2009-2023
Ramu	Nickel & Cobalt	15,000t Nickel 1,400 Cobalt (2013)	\$225 million	2013-

Source: Adapted from Banks, et al., (2014, p.15.).

In addition, about 0.4 per cent of the population (between 30-50,000 people) are engaged in small scale or Artisanal and Small-scale Mining (ASM) mainly in the Morobe-Madang-Sepik (MOMASE) and the Island regions of the country. Mineral Resource Authority (MRA) records show that this sector produced about 95, 000 ounces of gold in 2012 (Banks, et al., 2014). However, ASM is not the focus of this study as the emphasis here is on the large-scale mines operated by multinational companies.

Despite the high value of production and significant revenues derived from the mining industry, critiques reveal that there is little evidence of this industry’s contribution to development at both national and local levels. The argument is that mineral wealth

has not trickled down or been translated into better services to improve the living standards of people in the communities most affected by the operations (Banks, 2003; Filer & Macintyre, 2006; Kepore & Imbun, 2011). More recent literature on corporate social responsibility (CSR) internationally (Hilson, 2012; Luning, 2012; Slack, 2012), and nationally (Gilberthorpe & Banks, 2012; Kepore, Higgins & Goddard, 2013), also largely point to a lack of tangible results to show in terms of the benefits of mining. This was also evident in terms of the country's poor health indicators (see Chapter 2) and other social indicators in PNG. The policy framework surrounding the governance of mining benefits is central to the links (or otherwise) that prevent mineral wealth being transformed into tangible results.

### **3.2 Governing the mining industry**

At the broadest level, the direction of mineral policy set in 1977 — that the mining sector is to be the 'driver' of economic growth - has essentially continued. The current principal law that regulates the mining industry is the Mining Act (1992)<sup>8</sup>. The Mining Act (1992) is the overarching document that is used to guide the development of the legal documents around mining operations such as the Mine Development Contract (*MDC*), Compensation Agreements and Memorandums of Agreement (*MoA*). Other Acts that impinge on the operation of the sector, as James (1997) outlines, include the Environment Act (2000), Companies Act (1997), the Mining Safety Act, Sections B and C of the Income Tax Act, Foreign Exchange Regulations, Mineral Resources Stabilization

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<sup>8</sup> This Act was being reviewed in 2014 and some revised policy documents are out for discussion, but to date no new legislation has been put in place.

Act, Environmental Planning Act, Water Resources Act, Land Act and the Customs Act. These Acts are applied concurrently in mining projects theoretically to deliver best possible results for all parties, but have little relevance to the current study.

### **3.2.1 Governance framework for mining**

Governance in this context concerns the manner in which mining benefits such as taxes and royalties are collected, managed and channeled to different institutions including the district and LLG administration to deliver services such as health and, through this, contribute to the building of community resilience. This subsection reviews literature on the policy framework surrounding the governance of benefit sharing, with a particular focus on the Development Forum, and the MoAs, as these are central to the delivery of health services to the mine affected communities.

#### **Development forum and the formulation of the MoAs**

The Development Forum was originally created by the GoPNG to negotiate “the establishment of the Porgera gold mine in 1988 and 1989” (Filer, 2008, p. 120). The Porgera MoA targeted development that sought to meet the demands of the three main parties. This MoA was a formal agreement between the GoPNG, the Enga Provincial Government (EPG) and the landowners, and intended to bring positive changes such as the establishment of infrastructure and social services in the remote Porgera valley (Johnson, 2012). The decisions made on the Porgera MoA were originally categorised under five basic economic components: royalty redistribution,

optional equity, special support infrastructure development, economic development, and seed capital (Johnson, 2012). These agreements set the precedent in dealing with stakeholders' negotiations and the development of commitments for subsequent mines and mine-impacted communities in other parts of the country.

Prior to the Development Forum, the GoPNG in consultation with the mine developer came up with a position paper on the potential benefits of the development for the landowners. This position paper was then taken to the forum and the parties, including the lease area landowners, to negotiate the distribution of the mine-derived benefits. During the Porgera forum, the developer only came in as an observer, as it was the State that provided the legal basis for the various commitments that were made. The landowners then negotiated with the State and came up with their choices regarding the benefits they sought from mining. The fiscal regime of the Mining Act (in draft 2014) continues the earlier policy of allocating 2% of the value of production as a royalty to the landowners. It is from these negotiations that other benefits of mining were subsequently formulated under the MoAs. Institutionalization of the Development Forum in the 1992 Mining Act allows for discussions among the parties to the MoA for the best way to channel resources to the beneficiaries including landowners and the wider community. The involvement of the landowners in the development forum aimed to provide benefits to the mining communities, and sought to negotiate deals that suited the needs of the relevant stakeholders. There was an acknowledgement from the government that "there should at least be one landowner representative involved in the process of consultation" (Filer, 2008, p.122), although



the actuality has always exceeded this very low anticipated level of participation of landowners in the negotiation decision-making process.

The Mine Development Contract (MDC) is the formal, legal agreement between the GoPNG and the mining company (Filer & Imbun, 2004). The MDC if required also captures the commitments towards the landowners from the MoAs between the GoPNG, the developer and the impacted communities. This MDC also outlines the other key aspects of the mine development, such as the various taxes on the mining company that will be paid to the national government (Johnson, 2012; Filer, 2008), while the MoAs focus on the benefits of mining to the GoPNG, the Provincial Governments and the landowners. This study concentrates on the MoAs between the state, the developer and the MICs; and specifically the impact of mining benefits on the delivery of services to the host communities. Therefore, the details on the MoA including the various agreements and stakeholders to the MoA are discussed.

## **The Memorandum of Agreements**

The MoAs are important as they provide the framework for the delivery of services to the affected communities. The MoAs represent integrated benefit sharing agreements (IBSAs<sup>9</sup>)— as they have become known — and are then used as mandated documents that guide the delivery of services and community infrastructure including aid posts, health centres and district hospitals. The intention of the MoAs is to ensure that “both

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<sup>9</sup> IBSA refers to the benefits from mining shared by, both the landowners and wider community. It also outlines the type of projects and the roles and responsibilities of the relevant parties (Johnson, 2012). They are developed from the undertakings of the development forum (See also Filer & Imbun, 2004).

direct and indirect financial benefits are directed to those most affected by the mining operations” (Johnson, 2012, p.10). The ‘most affected’ are the traditional landowners whose land is within the respective mining lease. The MoAs from the different mining operations follow a similar standard format, but vary according to their specific contexts. The MoAs detail the benefit flows that the different parties will receive and the responsibility each stakeholder has agreed to or is required to undertake.

The focus of the MoAs is often on the benefits for the landowners and the wider local community who are impacted by the mining operations. This is because there is a strong sense of local ownership of the resource that is to be developed, and this translates into a belief that local landowners should receive significant benefits in return for allowing access to the resource. This was also seen as a way of limiting community resistance to the development. By institutionalising the Development Forum after Porgera, the GoPNG ensured that the landowners participate in the negotiations for the MoA.

There is a consensus that the three key stakeholders in any mine development are: the State (or GoPNG), the mining company/developer and local communities (See Figure 3.2). These are the parties to the MoA for each of the individual projects (Banks, 2003; Connell, 1997; Thomason & Hancock, 2011). The GoPNG’s responsibility in the formulation of the MoA is ensuring that the negotiation process is facilitated for these three key parties to the development so they can effectively negotiate the terms and conditions they seek. The GoPNG agencies include the regulatory authorities, National Government service and line agencies, Provincial Government and Local Level

Government; while the local communities comprise representatives of the affected communities, with a particular bias towards lease landowners.

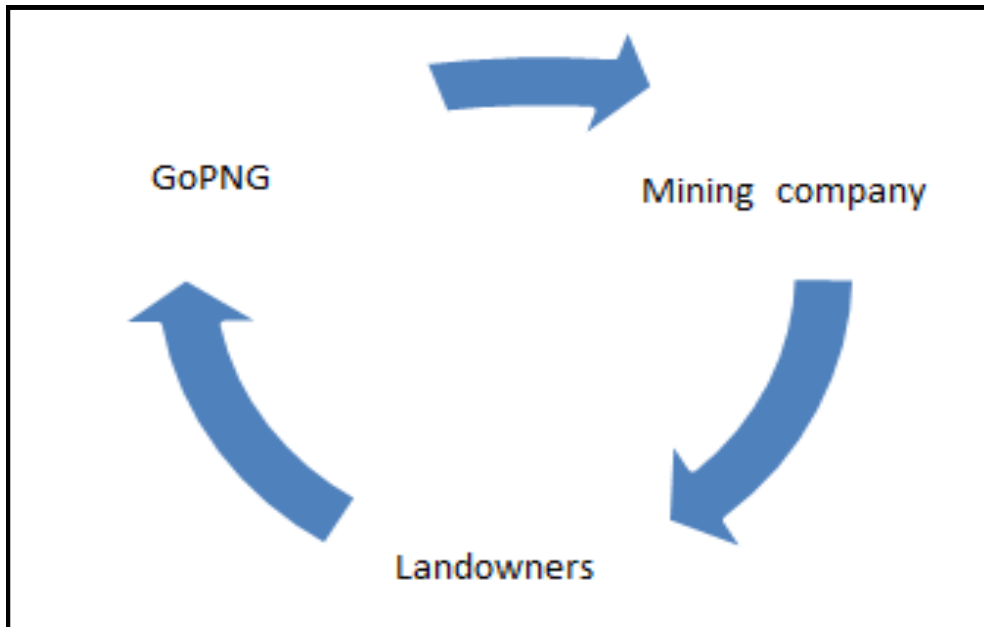


Figure3.2: Partners in the memorandum of agreement.

Source: Developed from Johnson (2012).

### 3.3 Stakeholders' roles and delivery of services

This section identifies and discusses the stakeholders involved in the delivery of health services to mine-impacted communities, and examines their roles and responsibilities in terms of the mining sector in general and the contribution to resilience of local communities around mining areas in PNG in particular. As noted above, in the PNG context there are three main stakeholders: the government, mining companies and local communities (Kepore & Imbun, 2011). Government departments which are responsible for regulation and service delivery in the mining sector are the Department of Mineral Policy and Geohazard Management (DMPGM); the Mineral Resource Authority (MRA), a statutory body; the Department of Health (as discussed in

the previous chapter); Provincial and Local-level governments; and the Department of Environment and Conservation (DEC). A fourth stakeholder group often included in discussions of the sector refers to the NGOs, donor agencies, and others (such as advocates and lawyers) who come in intermittently to assist the local communities in one way or another. Apart from the Churches involved in health delivery among mine impacted communities, this fourth group is not the focus of this research.

The following sections review each of the main stakeholders, particularly in terms of their roles and policies towards the delivery of services to help with maintaining and building resilient communities around mining operations in PNG.

### **3.3.1 The state**

As noted earlier, there are several different Government departments and agencies that are involved in the regulation of mining, and in the delivery of health services to mine impacted communities.

The DMPGM and MRA are two separate but inter-dependent bodies that coordinate mining operations in PNG. The DMPGM as a state department formulates standard regulations such as the MRA Act, 2005 to coordinate the mining activities. MRA on the other hand, plays the implementation role of these regulations often in partnership with other stakeholders. Prior to the establishment of MRA in 2006 the Department of Mining and Petroleum was responsible for mining activities as well as the regulation, monitoring, promoting, and recording of the country's mining activities. However,

many of the Department's responsibilities are now handed over to the MRA which was established in 2006 after the enactment of the MRA Act in 2005. The DMPGM is now responsible only "for the development and maintenance of the policy and regulatory environment within which the mining industry operates" (MRA, 2008c, p.7). In other words, it does not implement the policies it formulates. There could be difficulties in two separate institutions dividing significant roles in one making policies and the other implementing them. It could also affect the efficiency and effectiveness of either party in how they operate and could potentially result in a conflict of interest in terms of decision making caught in between the foreign investors and the state. Both DMPGM and MRA operate under the PNG Mining Act (1992) which remains the basis for regulation and policy making for the mining industry (as discussed earlier).

The MRA is a statutory body with a dual mission to promote a healthy and sustainable mineral industry that can protect the environment, and simultaneously maximize mining opportunities to ensure optimum benefits for the people of PNG. It has an organisational structure with a range of functions under the Minister for Mining and operates with a Board responsible for overseeing the operations of the authority under the directorship of the managing director (MD), who is also supported by a Mining Advisory Council (MAC). The MD directs the five divisions of the MRA, comprising development coordination; information and marketing; regulatory operations; geological survey and corporate services. Each of the divisions has their own goals and objectives to achieve as stipulated under the MRA Act 2005. Of the five divisions, only the development coordination division (DCD) plays an active role in addressing the social aspects of mining. The DCD aims to improve its consultation

process with stakeholders in project facilitation and management in all stages of mining. It also works to promote the sustainable management of spin-off businesses so as to improve the development prospects of affected communities<sup>10</sup>. The MRA, the broader institution, on the other hand, has defined sustainability as:

*In the context of keeping the mining industry continually sustaining the economy of Papua New Guinea. This means, programmes, including marketing, exploration, leading to the development of new projects and mines and sustainable development; using the revenue from mining to develop non-mining business and economic activities that will improve the people's livelihood". (MRA, 2008b, p.10)*

This definition has two elements. The first focuses on the need to maintain the mining industry's operations in the country, which requires encouraging more exploration that can lead to the establishment of new mining projects. This objective is targeted at ensuring the mining industry continues to play a dominant role in sustaining the economy, and seems to technically exclude social aspects of mining. The second element of the definition on the other hand, emphasizes the essence of sustainable development by encouraging the use of mining revenues to develop economic activities that will in turn improve people's livelihood. The authority "also strives to assist communities in and around the periphery of mines to invest their money in economically viable agricultural and business ventures" (MRA, 2008b, p.10). The MRA aims to assist local communities to develop in a resilient manner and to be economically sustainable both before and after mine closure. In the MRA's definition of sustainability, the operational phases will focus more on economic factors instead of integrating social aspects as well. It assumes that social aspects of people's livelihood

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<sup>10</sup> DCD also deals with other socio-economic issues such as investing royalties and providing advice on planning for sustainable initiatives

follow hand in hand with economic development towards achieving a healthy holistic society with positive developmental indicators.

Inter alia, the MRA also gets donor assistance from donor agencies such as World Bank (WB), The European Union and The Japanese Social Development fund. Amongst other donor agencies the WB has been heavily involved in a number of activities including “the drafting of the MRA Bill, the Corporate, Revised Mining Act, the revised Mining Safety act, [and] PNG’s mine closure policy” (MRA, 2008b, p.2). While the Donor agencies’ input is useful, the State through MRA remains in control of the decision-making process especially when policy matters are concerned. There is evidence that this is not always the case though, such as with a recently agreed institutional strengthening package granted to the DMPGM by the World Bank Group (WBG) that “has been a fairly efficient transmission of the WBG’s own thinking on best practices in these areas to all involved in the PNG mining industry” (Jackson, 2002, p. 4). If there is too much external influence especially when conditions are attached to lending by foreign donor agencies, this can undermine local and national sovereignty with potentially disastrous consequences which will in turn affect PNG as a whole. It could also illustrate how World Bank thinking can be imposed over indigenous views (Griffiths, 2005).

The effectiveness of MRA as a regulator, and the general contribution of the State to the delivery of health services and the building of resilience in these communities is undermined by the chronic and generalised weakness of state capacity in Papua New Guinea (Regan, 2005). To better understand the issues surrounding the benefits of

mining, the role of the State and its contribution to the building of resilient communities, Filer's (2004) discussion of the implementation of projects funded from the Tax Credit Scheme (TCS) and other government projects around the Porgera gold mine is used to illustrate the inefficiencies in the State's management of these funds.

The Porgera TCS<sup>11</sup> was originally designed to allow companies to use their funds to build local infrastructure for communities and claim this funding back from the state as a tax credit. At Porgera it was managed by the Porgera Development Authority (PDA) established in 1989. The PDA was responsible mainly for the implementation of the State's local commitments under the Porgera MoA, and specifically the "construction and maintenance of infrastructure" (Filer, 2004, p.6). This meant that PDA was responsible for enabling infrastructure such as roads, classrooms and health facilities, including those built under the TCS.

However, the introduction of the Organic Law on Provincial Government and Local Level Government (OLPGLLG) in 1995 required the transformation of PDA to the Porgera-Paiela LLG Special Purpose Authority (PPLLGSPA) which was bestowed with additional responsibilities in 1998. The OLPGLLG under Section 38 mandated LLGs among other things to prepare their own budgets, corporate and annual plans as well as accounting for their expenditure. The decentralisation of responsibilities saw PPLLGSPA take on the administration of the amalgamated LLGs of Porgera and Paiela, with a larger population than was originally intended for the PDA. In other words this

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<sup>11</sup> See Section 3.5.1 for details of this scheme – here the effects of poor governance are highlighted.



institution took on more responsibilities, some of which were not in the MoA, and it was not designed to handle. For example, some short falls in payments made on equipment paid by the Porgerans under the original MoA were covered by PPLGGSPA. In another instance a power supply cut to Paiam Township including Porgera hospital due to no-payment of bills saw locals' demands to restore electricity directed at the PPLLGSPA to cover the costs. Local demands and expectations can then be seen as a contributing factor in the local level government not effectively executing its responsibilities.

As Filer (2004) further reveals, the Porgera Joint Venture company officials were supportive of including more responsibilities for PPLLGSPA while the State employees responsible for the implementation of the MoA were continuously absent from these meetings. The actions of the mining company and GoPNG representatives can be seen as symptomatic of wider problems and reveals a lack of interest and participation from these two stakeholders. One result of this type of behaviour is that there is little or no consensus or direction to align local development strategies with national policies.

### **3.3.2 The mining company**

A mining company is a significant stakeholder for its host community (indeed usually the most significant), and therefore, it is important to understand its role and the forms of social obligation and responsibility it adopts in the delivery of services in the communities affected by their operations. Multinational miners have increasingly taken on social responsibilities in recent decades, largely under the banner of Corporate Social Responsibility (CSR). In the Papua New Guinea context, many of these

obligations are encoded in the MoAs, and also reflect concerns around risk management and 'social licence' (Filer, Banks and Burton, 2008; Banks et al., 2013).

The role of mining companies as a party to the delivery of services (including health) began in the early 1930s, when Bulolo Gold Dredging Ltd established the first formal hospital in the Bulolo district (Nelson, 1976). The establishment of these services by mining developers continued in areas around the Ok Tedi and Bougainville Copper operations in the 1970s. Most of these facilities were established to serve the mine workers, with some attention given to the workers' families (Kinlaw, 2008), but the services were generally not accessible to the wider community. These health services established by the mining companies were unregulated by the GoPNG, leaving the companies to establish services that suited their workers' needs, rather than the needs of the majority of the people within the adjoining communities. The "privately provided health services in PNG have been largely unregulated and unsupported by the government, with the exception of health services provided by churches" (Kinlaw, 2008, p.5). Thomason and Hancock (2011) also note a lack of evidence of government support in regulating health services provided by the mining companies in their host communities, and little evidence of the integration of such services with the public system.

More recently the mining companies have extended access to health services to the wider community (Thomason & Hancock, 2011), largely as mandated through the implementation of the respective MoAs, although these also vary between the mines and their host communities (as will be shown in Chapter 7). Hospitals have been built

with the support of the mining companies in the host communities at Ok Tedi (Thomason & Hancock, 2011), Porgera (Bonnell, 1999), and Lihir (Bentley, 2011), as the result of the MoAs and Benefit Sharing Agreements (BSAs) between the stakeholders. Some of these hospitals are within the mining township and provide services for mine employees and the wider communities. The mining companies also build infrastructure such as road links and water supply for their own purposes and depending on circumstances extend these services to certain communities, partly in order to secure a social license to operate (Macintyre, 2011). The MoAs also commit these multinational mining companies to community development through the building of roads and providing health services in rural villages to ensure continued support of their host communities (Hilson, 2012). As such, these companies are promoting a form of “free riding” (Uting, 2005 as cited by Hilson, p.135) as they often provide free services (including health) to employees of other businesses within the host communities. The companies’ establishment of enabling infrastructure such as road, electricity and water supplies are typically used by other entities (Macintyre, 2011). Free (or low cost) services from the mine create an illusion in the local population that this is an entitlement that can then become entrenched as the perception that free health services will always be available, without necessarily realizing that these services will cease when the mine closes.

This can create a dependency on the provision of services by the mining company among the other stakeholders — the GoPNG and affected communities— and can cause these people to overlook the challenges that are associated with the sustainability of such health services after mine closure. The analysis of the creation of

dependent communities by the mining industry within PNG (Banks, 1993, 2006; Ballard & Banks, 2003; Filer & Macintyre, 2006) and elsewhere (Auty, 1991) shows that dependency can also undermine the effective participation of these other stakeholders, and can work to weaken community capitals and through this the building of community resilience.

### **3.3.3 The affected communities**

The communities affected by these large-scale mines are recognised as the central stakeholder in this study. They typically include the mining lease landowners, other people within the District that host the mining operations, and other users of business and government services who come from outside the District. These communities are often bounded by physical and social features such as mountain ranges, islands and/or common kinship relationships. As Ballard and Banks explained such communities are “both, the most recent addition [to the set of stakeholders] and the most flexible and extensible group” (2003, p.297). PNG has over eight hundred languages and consequently a large number of different value systems and cultures. Different cultural practices influence the symbolic capital, myths or religious practices of the various groups, as well as how the local population views the environment they are a part of. Cultural practices associated with environment were highlighted by Halvaksz who studied the Biangai people (Morobe Province) and stressed the ways in which land and the natural environment were invested “ with aesthetic qualities that attract and repel gardeners and spirits, animals and humans, forming and divesting in social relationships ” (2008, p.23). People are attached to their land for reasons that include sacred sites where medicinal plants are located, as well as from gardening and hunting.

The use of locally accessible medicinal plants is further emphasised by Kipalan et al (2012) who have noted the use of specific herbs as a CAM by parents or guardians to heal illnesses in children. As Kirsch (2008) clearly points out, Melanesians are not formally qualified environmentalists, but they do have cultural rituals and taboos that link them to the conservation of their environment. They value their land and its surroundings and typically protect it from harm because their livelihood is embedded socially, politically and economically into their land. Their land is the basis of their identity and existence (Ballard, 1997; Banks, 2008).

The participation of these communities as stakeholders in the decision-making around these mining operations is often limited, especially after the conclusion of the Development Forum negotiations. As Filer (2004, p. 7) highlights, while the PPLGSPA under its MoA is responsible for “the planning, design and implementation of some of the infrastructure projects” the national government is required to assess the priority and value of project proposals provided by the mining company. The mining company submits a proposal for the type of infrastructure the developer assumes the local communities require, and the national government (MRA) uses these proposals to decide on the priority projects for the impacted communities. This undermines the input of the PPLGSPA, the very institution that is mandated by the MoA to plan and deliver infrastructural projects in the communities. This is a clear example of the lack of community representation in planning for facilities that will affect them. Some authors (Ballard & Banks, 2003; Kepore, Higgins & Goddard, 2013) also support the view that there is a lack of participation by the indigenous or local people who are overlooked by the other stakeholders in decisions that affect them.

### 3.4 Distributing mineral wealth

Mineral wealth refers to the benefits from mineral resources which include “metallic ores in the form of non-renewable (natural capital), which can be converted into other forms of capital” (Filer & Imbun, 2004, p.1). These revenues are collected by the government through direct and indirect avenues. Direct revenues as specified in the GoPNG’s fiscal component of its mineral policy framework are collected directly from the mining companies and their employees. Indirect revenues are collected from other companies and industries whose incomes are generated through the supply of goods and services to the mining companies (Filer & Imbun, 2004). The section provides an analysis of the types of mineral benefits and their impact on service delivery (including health) in the affected communities.

Benefit flows and the distribution of wealth are very important to the development of the host communities as well as the country at large. The current policy and management approaches to the distribution of mining revenue such as compensation and royalties are not transparent at a number of levels. Many landowner associations use traditional structures to share benefits that lack transparency (Ballard & Banks, 2003, p.304), and thus consequently contribute to the challenges confronting vulnerable community members including women and children. There is an absence of strategies that address equal distribution of mining benefits and gender inequalities in all levels of government (local, district and provincial) (Byford, n.d). Forms of gender

inequality such as this prevent women from fully utilizing their potential to contribute to building their communities (Agarwal, 2001).

### **3.4.1 Direct revenues**

The direct benefits of mining are the revenue flows from the mine and fall under two main streams: compensation, dividends on equity shares in the mines, and royalty payments; and wages associated with mine employment.

#### **Compensation**

The literature on mining benefits reveals the main direct form of cash paid to the local community members is for the damage done to the natural environment (or natural capital) and built capital in the forms of compensation (Filer, 1997; Filer & Imbun, 2004; Johnson, 2012; Macintyre & Foale, 2002). Compensation for damage is regulated by the Mining Act, and the rates are determined by negotiated compensation agreements for each project. It is made to the indigenous populations whose livelihoods are destroyed by the mining operations (McLeod, 2000). Adequate compensation was defined by one landowner association member in this research as landowners happily accepting the cash payments for the destruction of their environment.

The concept of compensation is best illustrated with examples from Ok Tedi Mine Limited (OTML) and the Porgera gold mine. The Porgera Mine, originally operated by Placer Dome, discharges 18,000 tons of tailing and other waste rock daily into the

Porgera River. The company paid significant amounts of compensation to the affected communities (see Banks, 2003, Johnson, 2012) but these payments were claimed by some as insufficient in comparison to the damages (Veiga, Scoble &, 2001). In many cases, not all impacted communities were compensated, as revealed in the OTML case on the Yongom villages. The OTML originally refused to pay for damages done to the local villages who lived downstream of the Ok Tedi River where the mine waste had been dumped (Jorgensen, 2006, Veiga, et al., 2001) because the Yongom people were not originally included in the MoA. However, the mining company at that time (BHP) was sued in Australia, consequently leading to payments for the environmental damage done to the concerned communities (Jorgensen, 2006). Studies of communities excluded from compensation for environmental damages show a great deal of suffering when their livelihood depends on the environment for gardening and hunting purposes (Jorgensen, 2006).

### **3.4.2 Royalties**

Royalties are paid to lease landowning communities for the “mineral resources extracted beneath the land” (Johnson, 2012, p.36). This is paid by the developer to the GoPNG who then distribute it to provincial and local governments and landowners who live within the Special Mining Lease (SML). The payments made are a specified percentage of the value of production (2%), and the distribution is according to percentages agreed as part of the MoA negotiations (Filer & Imbun, 2004; Johnson, 2012). All mining lease landowners have access to some royalties; although there are significant challenges regarding the distribution and expenditure of these monies



(Ballard & Banks, 2003). Most of this money is distributed through locally created structures with few written records kept; hence it is hard to know in detail if there are any benefits to be seen on the landowners' standards of living (Banks, 2003) or indeed if there is a contribution to the building of resilience in these communities.

Moreover, neither the arrangements for compensation nor the royalty payments consider the social and cultural aspects of the concerned communities. This causes injustices because of Melanesians' understanding of the concepts of compensation and royalties which foregrounds the recognition and integration of the physical, social aspects of landownership, and emotional and kinship relationships (Filer, 1997; Gilberthorpe, 2013). It must be understood that for Melanesians, money does not necessarily compensate for the loss of cultural heritage and the loss of these communities' original environment. At present the cash form of compensation and royalties payments detract from the building of cultural and natural capitals that could contribute to a higher level of resilience in these communities.

### **3.4.3 The equity stake**

The equity stake refers to the direct equity participation of landowners in the Mining Company, as negotiated by locals and stipulated in the MoA (Johnson, 2012). This initiative originated at the Porgera Mine (Banks, 2003); consequently it was copied by other mines in PNG. Landowners in different mines in PNG are now equity beneficiaries in their respective mines under the management of the Mineral Resources Development Company (MRDC). This equity share is typically relatively

small: 2.5% at Porgera, for example. This is potentially good for all concerned parties, because the revenue associated with an equity stake can be used to build the financial capital of the community that in turn can contribute to a higher level of resilience in these affected communities. However, this contribution can be jeopardized if equity revenues are distributed through local community structures that are highly informal and lack transparency (Banks, 2003).

### **3.4.4 Employment**

Employment as a direct benefit to local communities occurs at two levels: first, the employment of the landowning population and second employment of migrants to the area. The first brings in wages for the local community and contributes to the increase in the income of local households, building up their financial capital and sustaining family activities such as paying children's school fees and health services. Most MoAs contain provisions that give preference for employment to local landowners. Several studies (Banks, 1993; Imbun, 2000, 2006, 2007; Macintyre, 2003) thus far have confirmed the significance of community members' access to cash through employment with the mine: Bainton and Macintyre (2013a) in Lihir and Johnson (2012) confirm these are the largest on-going local revenue flows at Porgera. In spite of these benefits, other studies (Johnson, 2011; Johnson, 2012) revealed the socio-economic difficulties caused by the employment of the local populations, with many of the locals being 'first time' employees in a formal context. As one example of the problems it can create, some locally employed men with a cash income married several wives who struggle to benefit from the husbands wage resulting in an increase in domestic

violence (Bonnell 1999, and see Section 3.6.2 below). The literature suggests that the wages from employment typically showed less tangible results in terms of improvements in livelihoods in the concerned communities than anticipated.

The employment of migrants from outside the area also creates issues as it attracts additional population to the mine area, and this places stress on local resources, such as water, land, and public facilities (schools and health services), and complicates local identity (Gilberthorpe & Banks, 2013).

### **3.5 Indirect benefits**

Indirect benefits imply those ones from other avenues such as contributions to the local economy and infrastructure (Johnson, 2012; Macintyre & Foale, 2002). These benefits are targeted to benefit both the landowners and wider community through the contribution made by the mining company in line with the MoAs or as a corporate social responsibility (CSR) towards the affected communities.

#### **3.5.1 Tax credit scheme**

The tax credit scheme (TCS) is composed of payments forfeited by the national government to allow the funds to be used by the host province or the host district of the developer (Banks, et al., 2014; Johnson, 2012). The TCS revenue is directed to community infrastructure building. Examples from Lihir and Porgera show evidence of these revenues being used to build facilities such as roads, health facilities, power and water supply (Johnson, 2011; Macintyre & Foale, 2002). Revenues directed into

building infrastructure in the affected communities shows positive improvements for these communities, although the new infrastructure suffers from the governance issues discussed earlier, especially in terms of on-going maintenance.

### **3.5.2 Business opportunities**

Business contracts for the supply of goods or services to the mine are another form of economic benefit available under local preference clauses to the landowners who organize themselves to secure contracts to carry out projects that range from building roads to constructing community halls or small tree-planting work. In Lihir for example, the local landowners are particularly adamant that business contracts are to be given to them and not others: they use the phrase '*my land, my work*' (Bainton & Macintyre, 2013a) to emphasise this. In some of these contracts, the company pays the contractors to provide community infrastructure and services. The awarding of business contracts to landowners or within the SML is also evident in Porgera, with the result that there were a large number of local community members engaged in these business contracts (Johnson, 2011; Johnson, 2012). There is again little evidence that people's living standards have increased as a result of this involvement from the income of these business contracts. Profits from the business contracts are often diverted to cultural activities such as compensation payments or feasts (see Banks 2003, Bainton & Macintyre, 2013). This view is supported by Curry who shows that in other parts of Papua New Guinea income from business contracts are "frequently redirected to the indigenous non-market economy" (Curry, 2005, p. 231). Several empirical studies that investigate income from indigenous mining population show it is

diverted to other cultural activities, as well as being shared with relatives, not necessarily in cash, but also in kind (Bainton, 2008; Bainton & Macintyre, 2013a). Limits to the contribution to medical services and school fees can at times be related to cultural socio—political behaviours that ultimately detract from community resilience.

Many observers (Ballard & Banks, 2003; Byford, n.d; Filer & Macintyre, 2006; Gilberthorpe, 2013) have argued that overall there is lack of evidence to show a positive contribution from these various mining benefits to the local communities, and most instead highlight the difficulties for, and impacts on, affected communities, two of which are explored in the following section

### **3.6 Local level impacts**

There are both positive and negative impacts of mining on the local communities; however, the negatives tend to outweigh the advantages especially when it comes to the overall lack of evidence of these benefits being turned into tangible, sustainable results. Many have argued that mining has brought more problems than benefits to the local communities. The revenue flows discussed above are a major driver of the negative impacts of these mines, and this creates challenges for communities in terms of building resilience. These challenges range from land conflicts (Allan, 2013, Banks, 2008) to domestic violence (Byford, n.d; Johnson, 2011), due to the weakening of the local State and associated governance (Filer, 2004), and more. This section will use only two issues to illustrate challenges that confront the mining communities: land conflicts, and the impact of mining on women.

### 3.6.1 Land conflicts

The issue of landownership is one of the most complicated in a Melanesian mining context and has contributed to numerous conflicts. This as Jorgensen (1997) argues is due to three main reasons: numerous claimants to particular pieces of land, complex land histories giving rise to claims from conflicting clans, and the state's recognition of indigenous land rights giving rise to pressure by these landowners on the state.

Numerous candidates contesting ownership over an area of land has caused difficulties in identifying the rightful owners of that land. Several clans can often claim ownership over one stretch of land which is usually complicated by the absence of written records, the lack of specific surveyed measurement, and the use of imprecise natural features such as a mountain range or valleys as boundaries (Banks, 2006; Jorgensen, 1997).

Land ownership in PNG is also complicated by people's oral histories and social identities, and their connections to the physical land features. Land is a "shorthand for ties to locality— whether terrestrial or marine – [and] is the basis for membership and nationality for most Melanesians" (Ballard, 1997, p. 48). Examples of landownership in mine-affected communities are no different from other non-mining communities. As Banks (2008) argues, resources are deeply connected to the creation and continuation of kinship relations and identity of people. Landownership is often difficult to clearly identify because candidates have their own stories and diverse connections with

landscape and social life. This can cause complications in separating people from the physical features they associate their identity with, and in turn this can affect the delivery of infrastructure and services when landownership is contested.

Jorgensen's (1997) argument that the State's recognition of indigenous land rights gives rise to different claims regarding the benefits of mining is true in the sense that the indigenous people argue for their rights to the benefits of mining. There have been cases where landowners demand compensation and put the developer under pressure to meet these demands, outside the scope of the MoA for the operation. This view is supported by Filer (1990) who describes the ultimatums of landowners in Bougainville who demanded an enormous 10 billion kina compensation from the company for environmental damages: when this was not forthcoming, violence followed and the mine closed. Dove et al as cited by (Banks, 2008, p.25) summarise the significance of land and therefore highlight the importance of landownership:

*Land is our life. And our physical life-food and sustenance. Land is our social life; it is marriage; it is status; it is security; it is policies; in fact it is our only world.*

Indigenous landowner issues are complicated as people's livelihoods are associated to their environment. In many cases in Melanesia the signing of a MoA does not always stop people from demanding additional revenues and benefits. Land rights issues in PNG cannot be eliminated but they can be managed to a level where benefits are shared more equally among all parties. The next subsection explores the impact of mining on women.

### 3.6.2 Impact of mining on women

Despite the obvious benefits that flow from mining as discussed above, women in the affected communities are confronted with numerous cultural challenges that disempower them and do not allow them to equally participate in development activities, or reap the benefits of mining. Many of these women also struggle to cope with burdens brought upon them as a result of mining. These struggles are compounded by the overall challenges in the country where women face a range of issues including poor representation in decision making, lack of access to services, and the need to deal with social issues such as overcrowding in households caused by in-migration (Banks, et al., 2014).

Women's participation in decision making is limited in the mining communities. During the initial negotiation process, in the discussion on the benefits of mining, women are typically excluded, or have little representation (Banks, et al., 2014). As such, their views are not included or given priority in the development plans of their respective communities (Macdonald, 2003; Macintyre, 2003) which often results in women receiving few benefits while carrying the burden of the negative impacts of mining. Women's participation in decision making is restricted when men do not appreciate their efforts towards community development.

Women struggle to access services including hospitals and stores as well as land and their gardens. The following is a commentary on several life situational challenges made by a woman in Porgera:



*Before I was married to a man. We were married in church and were happy. But after the mine, the man was spoilt. He married another woman and there is no happiness in my marriage. I have six children, one passed away. My husband was employed by Barrick as a bus driver. There was no money for the children and he would not send the children to school. I thought my husband would help, but he never turned up. He went away with 2<sup>nd</sup> wife, then 3<sup>rd</sup> wife.*

*How do I get money? It is 10 years now and no money. How do I get money to pay schools, bus fees, hospital fees? What can I do? We need an Aid Post, we need electricity and a water supply, an elementary school, but there is no help from NGOs, Provincial government, National government, Barrick. We are without anything (Johnson, 2011, p. 33).*

Lack of transport, lack of finances, no aid post, lack of other enabling infrastructures such as power and water supplies, and other human rights issues, are all part of this woman's story, which is a reflection on the experiences of the wider community. Another example of the provision of health services comes from Misima where there were some positive impacts of mining, including better health services during mining, but generally people, especially women suffered a great deal after mine closure (Byford, n.d).

Women are further seen to be among the most disadvantaged in the affected communities because of problems such as family neglect and domestic violence (Bonnell 1999). Women's views on lack of access to services are acknowledged by some and connected to the situation of other marginal groups such as the elderly and the younger generation who are also disadvantaged through a lack of education, employment and finances (Johnson, 2011). For the purpose of this study I use the example of the delivery of health services in the mine impacted communities to see how the delivery of these services (and the challenges to this delivery) contributes to

the building of community resilience in these communities and so can turn this situation around.

Conversely, there have been instances where women are empowered to participate in decision making in development projects in their communities. A recent study on the Community Mine Continuation Agreements (CMCAs) at the Ok Tedi mine showed that representation of women on the negotiation team brought positive changes such as payment of compensation money paid into family accounts and the securing of 50 per cent of all scholarships for women (Menzie & Harley, 2012). This implies that the current issues confronting women in the affected communities in PNG could be changed with greater representation of women in decision-making positions and processes.

### **3.6.3 Broader impacts of mining on health**

Mining impacts on the health of people in the affected communities in a variety of ways. Four are covered here: environmental effects; environmental health; social impacts and dietary changes. Some authors' (Banks, 2002; Banks, Kuir-Ayius, Kombako & Sagir, 2013; Filer & Macintyre, 2006; Macintyre & Foale, 2004; Mudd & Roche, 2014) work on the impacts of mining in PNG have recorded environment and social issues that impact on health. Environmental impacts of mining in Melanesia are largely centred on waste management (Banks, 2002). For example, disposal of rocks dug out from the mining pits, as in the case of Ok Tedi and Porgera, have polluted downstream river systems (Kepore & Imbun, 2011). In Lihir a recent study found the disposal of

waste rock into the adjoining ocean contributing to a “significant decrease in coral cover” (Haywood, Dennis, Thomson & Pillans, 2016, p.36). Another current study on the geochemical signatures of oil and gas mining activities in sediments reveal that the “increase in mining exploration has led to intensive pressure on the environment, and if not properly managed, it can adversely affect natural environments” (IEA/OECD (2014) as cited by Schneider et al., 2016, p.148). These physical and chemical impacts of mining can directly impact on the health of affected communities that use these ocean and river resources.

Studies have also shown that mining impacts on environmental health in affected communities by increasing population (through migration and population growth over time) and at the same time reducing the area of land in which these communities are living (through loss of land to the mining operations). This leads to over-crowding and water and sanitation problems (Johnson, 2011).

The third area of impact is those effects caused by the social changes in communities, and particularly the effects of increasing prostitution, alcoholism and violence. Injuries from increasing rates of domestic violence and tribal fighting (Burton 2014 ) impact on health, particularly for women as noted above, and literature shows rates of HIV/AIDS are high in mining-affected communities (Lepani, 2008). Environmental effects can also create “ongoing social and cultural dislocation” (Mudd & Roche, 2014, p.313). For example the relocation of landowner villagers to make way for mining operations can contribute to challenges such as displacement that can tear the existing social fabric through social destabilisation and the scattering of kinship groups (Hermer, 2015). This

in turn can create challenges in family or community members in reconciliation with a sick person as part of healing in a cultural context.

Finally, lifestyle changes associated with increased access to financial capital bring a range of new 'diseases' into these communities. For some, rates of obesity and other NCDs increase, even while other diseases (malaria) decline (Bentley, 2011; Johnson, 2011).

### **3.7 Mining and health services**

The delivery of health services in the mining communities is impacted by the interaction of factors such as the availability of road linkages, the transport system and enabling infrastructure. It is also framed by a basic dilemma — while the resources that are put into health service delivery increase significantly as a result of a mine development, so does the size of the population that needs to be serviced, and so do the types of illnesses and conditions that a previously remote community is exposed to. As noted above, even the benefits of mining to the impacted communities can create dependency among the landowners; especially in those who depend significantly on the benefits (see Section 3.4). This can create what has been called the local resource curse (Banks, et al., 2014), which can exist at all stages of mining.

In all the selected mine affected communities in this research, the GoPNG had established and delivered health services well before the introduction of the mining operations, although the effectiveness of these services was typically poor. In the case

of both Misima and Hidden Valley the state has established several health centres and aid posts; district hospitals established in Bwagaoia (Misima) and Bulolo (Hidden Valley) the respective districts' headquarters. In some cases, both the GoPNG and the Church established health services prior to mining operations. In Lihir for example, both the GoPNG and the Church established health facilities prior to the mining operations. Through the Nimamar Local Level Government, there are several aid posts and several sub-health centres, but the Lihir Medical Centre was established as a result of the Memorandum of Agreement (MoA) for the mine. Chapters Six and Seven will provide the detailed information on the current health services in these mines. The state provided services have been sustained over several decades, although not without some outstanding and continuing challenges as discussed in chapter eight (Connell, 1997; Whittaker & Thomason, 2009; Kinlaw, 2008).

It is evident that despite the mining benefits, the adjoining communities still encounter challenges in the effective and efficient access to health services including lack of transport and financial constraints that restrict access to these services (Johnson, 2011; Thomason & Hancock, 2011). And, in some respects, the benefits of mining could be seen as a resource curse, one that creates dependency in the communities on the mining-derived revenue, infrastructure and services.

It is worth noting that available literature on health within mining-impacted communities globally and within PNG focuses mainly on the overall status of different diseases within these communities. Several studies on health services in mining reveal the status of different diseases and their outcomes. In PNG, as noted above, studies

carried out at Lihir (Bentley, 2011), Porgera (Johnson, 2011) and Ok Tedi (Thomason & Hancock, 2011) have focused on health outcomes trends such as malarial infection prevalence, life style diseases and sexually transmitted diseases. There is less emphasis on the sustainability of the delivery of health services (Shandro, Veiga, Shoveller, Scoble & Koehoorn, 2011) , or on the contribution of different forms of community capitals including social capital (Poortinga, 2011) to building resilience in the context of these health services.

For health services, dependency is further complicated by challenges that influence the decisions of local community members in accessing them, including road access, transport, and financial constraints, as detailed in the following chapters.

### **3.8 Conclusion**

The mining industry is currently very important to the economy of PNG and this will continue for several decades at least. This industry contributes over 50 per cent of the country's export revenues. Mineral revenues are generated from various taxes including corporate and withholding taxes, dividends from equity shareholding in the operations, and through a 2 per cent royalty to the GoPNG. Recent figures from the BPNG (2011, 2012, 2013) illustrate the mining industry's dominance over other sectors in the country (and see Banks, et al., 2014, Chapter 4). Critics, both internal and external, argue that despite the substantial revenues obtained from the mineral resources by the government, there is lack of evidence of positive contributions to development at both national and local levels.

The three main stakeholders in the mining industry are the GoPNG, the developer and the MICs. The GoPNG is responsible for the administrative regulations for other stakeholders to abide by. Prior to the negotiations on the MoAs a Mine Development Contract is formed between the GoPNG and the mining company. The MDC is mainly a profile of key aspects for mine development that could also capture MoAs if required. These three stakeholders are involved in the negotiations of the MoA for each mining operation. The state is the main regulator who is obligated to effectively coordinate through the DMPGM and MRA to ensure that the negotiation process for the MoA includes relevant terms and conditions each stakeholder seeks.

The analysis of the literature revealed that despite the high revenue from mineral wealth, there are often few positive results in the impacted communities. There is lack of evidence of long-term sustainable outcomes to show for the benefits of mining invested in the host communities, and so despite the regulations on the governance of these benefits, the local populations continue to experience difficulties. Review at the local level revealed land conflicts complicate benefit sharing as it is sometimes difficult to identify the real landowners due circumstances surrounding landownership in Melanesia. Women, children, elderly and the youth face more problems, and women in particular carry the burdens of the social ills of these communities. Therefore, in order to turn the situation around, community resilience needs to be built rather than undermined as is currently often the case.

There are both positive and negative effects from large-scale mining (Ballard & Banks, 2003; Byford, n.d; Filer & Macintyre, 2006; Gilberthorpe, 2013) but the disadvantages in most cases tend to outweigh the advantages. There is lack of evidence that the overall benefits are being turned into noticeable results. The mine affected communities experience challenges ranging from land conflicts, to inequalities, violence and poor government service delivery. The next chapter explores the literature and theories surrounding the building of community resilience, and based on this constructs a locally-informed 'Bilum Framework' to better understand how the challenges created by the mining industry to community resilience can be addressed in the context of the delivery of health services.





## Chapter 4

# Analytical framework: linking community capitals, community resilience and health services

### 4.1 Introduction

This chapter critically reviews the literature on Community Resilience, with a focus on understanding how resilience can be connected to the delivery of health services in mine impacted communities (MICs). It illustrates how an understanding of the concept of community capitals (CCs) can provide insights into the building of resilience, and assist to achieve effective and efficient health services which are sustainable. This literature review focuses on the relationship between community resilience and sustainability of health services in mine-impacted communities by building on existing health and resilience models such as the work of Kulig, Edge, and Joyce (2008). The resilience of communities relies on the existence and on-going strengthening of community capitals. These two concepts — *resilience* and *capitals* — are therefore strongly related. The literature on community capitals is reviewed to provide a comprehensive theoretical framework, and draws on work that explores how the concept of community capitals can be used to provide indicators of the level of resilience in these communities. By doing this, the chapter intends to answer the research questions one and four as set out in the introduction, that seek to understand the links between community capitals, resilience and the delivery of health services, and to explore how a Melanesian-centric ‘Bilum Framework’ can add to the understanding of these connections, respectively.

After this introduction, this chapter is presented in seven sections. Section 4.2 discusses the genesis of the concept of resilience and associated theories, including the two main perspectives on resilience: ecological and social science. Individual, family and community resilience and the relationship between these terms will be unpacked; from here an operational definition of Community Resilience which is to be used in this thesis is developed. Section 4.3 introduces the concept of community capitals and the links to health; particularly in terms of health service delivery. The Bilum Framework, which pulls the above community capitals concept into a Melanesian worldview and which forms the central organising framework for this research, is then introduced and explained in Section 4.4. The various community capitals are then discussed in Section 4.5 and an explanation of each of these capitals from a Melanesian perspective is then given. Section 4.6 discusses sustainability and mining in a Melanesian concept. Section 4.7 outlines some limitations of the Bilum Framework. Section 4.8 concludes this chapter, reviewing the place of the community capitals and the Bilum Framework in relation to the broader research project.

## **4.2 The genesis of resilience as a concept**

The origins of resilience thinking lie in the early 1970s with Buzz C.S. Holling's (1973) seminal paper on resilience (see Folke, 2006; Walker, Holling, Carpenter, & Kinzig, 2004). The concept of resilience originated from ecological studies, exploring the varied ability of ecosystems to absorb and adapt to external pressures. This literature, largely from natural scientists, tended to focus on the resilience of ecological systems

which are damaged by humans (Gallopín, 2006; Magis, 2010). Throughout this literature the complexity of the term, and its relationship to a series of other concepts, is highlighted. As a result, it can be a challenge to define resilience in isolation (Berks & Ross, 2013; Davoudi, et al., 2012; McIntosh et al., 2008). While there are various definitions of resilience, the concept has evolved from two different epistemological perspectives: (i) an ecological viewpoint, and (ii) a social science systems approach which foregrounds people and institutions (Welsh, 2014). Most recently the two have moved closer together, pointing to an increase in the use of an integrated resilience perspectives for “understanding the dynamics of social-ecological systems” (Folke, 2006, p.253). The following subsections explore the two perspectives in more depth.

#### **4.2.1 Ecological perspective**

The ecological perspective views resilience as the capacity of living organisms to survive in a physical environment in relation to each other’s functions (Deutsch, Folke & Skånberg, 2003). The survival of an organism is influenced by the actions of other organisms that are competing for survival in the same environment. The successful survivors are the ones with a greater ability to adapt to disturbance while the vulnerable, with lesser capacity to withstand the pressures of change, typically vanish. More holistically, it is defined as a system “achieving desirable states in the face of change” (Engle, 2011, p.649). It is likely that many systems encounter disturbances, but the important feature of resilient systems is that they are able to adapt or maintain their usual operations in the face of these disturbances.

According to the ecological theories of resilience (McDonald, 2007; Walker, et al., 2004) there are three categories of ecological systems:

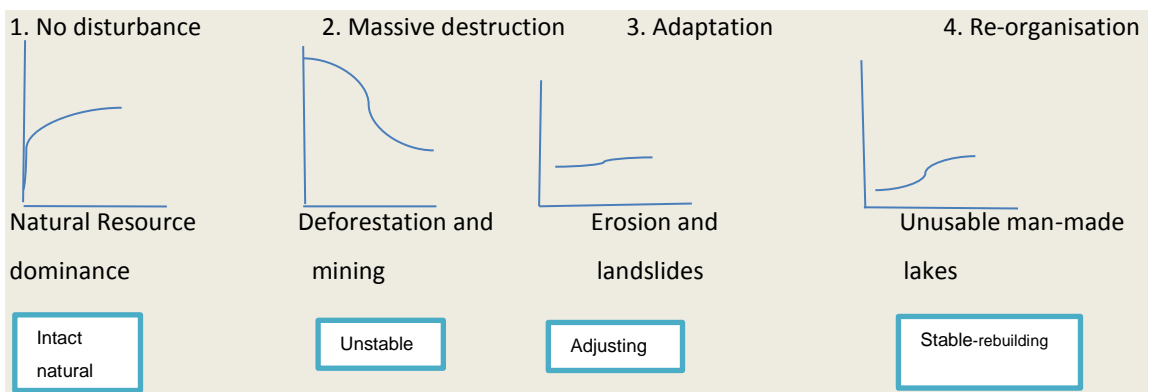
- i. adaptive self-organising systems;*
- ii. systems that can go through various stages of change when they encounter a situation that is different from their usual life-style; and,*
- iii. systems go through a repeated process of adaptive cycles of conservation, collapse and re-organization in their growth with this reorganisation being vital for the continuation of the ecosystem (Elmqvist, et al., 2003; McDonald, 2007).*

The third of these categories describes those that are rarely able to return to their original state. This particular category of system exemplifies the notion of resilience among ecological systems. Resilience, therefore, controls the extent to which a system can undergo changes before it encounters a disturbance that takes it to another stage where it can again stabilise around a new equilibrium. This is closely related to the concept of adaptability which can be defined as the learning aspect of a system that copes with the disturbances that have occurred (Deutsch, et al., 2003). The more this particular system can adapt the more resilient it is. Therefore, the concepts of adaptability and resilience are intimately related.

Transformability refers to the capacity of an individual system to change to a different system (Walker, et al., 2004). Transformations in ecology typically refer to processes that occur in response to harm or repeated negative experiences of the system (Gallopín, 2006; McDonald, 2007). Such systems have undergone continuous negative encounters that can destroy their original state. These aspects of resilience become significant when there is continuous negativity or undesirable processes impacting on the stability of a system; adaptability is no longer possible within the system to survive, and therefore it needs transformation (Folke, 2006). This debate is supported by Folke,

Carpenter, Elmqvist, Gunderson, Holling, and Walker (2002) who argue that in these instances an ecosystem can never return to its original state. This can also be applied to the social world: a resilience based approach applied to assess the sustainability of the Murray-Darling Basin, Australia for example, indicated that changes caused by biophysical aspects impacted deeply on economic and social conditions over an extended period of time (Walker, Abel, Anderies, & Ryan, 2009). These transformations exemplified and led to irreversible changes in the delivery of goods and services in the region (Walker, et al., 2009).

Inevitably, “human activities put pressure on the environment” (Deutsch, et al., 2003, p.205), and these pressures on the natural environment can drive transformations through four stages that are often sequential and related, all of which reflect different ways of understanding resilience (see Fig.4.1).



**Figure 4.1: Resilience Vs Adaptability and Re-organisation**

Source: Adapted from Deutsch, et al. (2003).

Figure 4.1 illustrates four possible stages and processes each of which reflects a form of resilience that can occur in the resilience and transformation of the natural environment due to mining. For instance, in stage 1 there is intact forest, water and

the land and they interact with each other. In stage 2, there is mining, and the land is exposed possibly with big open pits and/or environmental damage. In stage 3, there is erosion and landslides, and the pits are filled with water waste. By stage 4, the large pits have transformed in to unusable man-made lakes.

Contrary to ideas by Walker et al. (2009) and others, some have argued that a system is capable of re-organising itself to maintain its basic functions; rarely does it change to a completely different system (Elmqvist, et al., 2003). This view highlights the concept of resilience as “the return to equilibrium after a disturbance” (Berks & Ross, 2013, p.6). Others such as Buikstra et al. (2010) and Magis (2010) also define resilience in accordance with individuals and communities recovering from adversity and surprises.

Resilience is thus also associated with issues such as diversity of species, human opportunity, and economic options to maintain and encourage learning and adaptation (Folke et al., 2002). This strongly relates to different societal contexts, such as mining situations where alongside the exposure of local populations to massive changes which have negatively impacted on the concerned communities, opportunities and economic options can expand.

#### **4.2.2 Social science view**

This ecological approach to resilience has been used to inform understandings of social resilience. The notion of an organism in a biological sense is used as a metaphor to explain organizational structure (Adger, 2006; Cote & Nightingale, 2012; Walker & Cooper, 2011), and to illustrate the idea of the inter-dependency of different parts of

an organisation (or community) which depend on one another, in ways that are determined by the nature of the operational environment. Folke et al. (2002) likewise link resilience to people and the changes in the environment they live in. Social scientists generally agree with the approach of the natural and physical scientists but tend to apply the idea of resilience to social issues such as public policy for example (MacKinnon & Derickson, 2013; Stokols, Lejano & Hipp, 2013). The analogies with ecological systems are inappropriate if used in isolation from an examination of an institution's social roles, however, the ecological ideas of resilience can be adjusted and integrated with other conceptual tools and therefore applied to a particular social context.

There are criticisms of attempts to integrate and apply the ecological concept of resilience to the social setting of a community. Several authors (Carpenter, Walker, Anderies & Abel, 2001; Klein, Nicholls, Thomalla, 2003) disagree with this approach, in part because they believe the concept to be too imprecise. This as Ungar (2004, p.341) explains would be "inadequate to account for the diversity of people's experiences of resilience" because individuals' or groups' encounters vary in different contexts. Other critiques on the use of the ecological approach to resilience in the social world point out that this approach focuses more on the individual (organism) (Runswick-Cole & Goodley, 2013; Ungar, 2004) and the environment; they are so focused on the individual organism they do not look at other risk factors or wider activities which can make something vulnerable, for example the destruction of the environment by mining operations. Some critics have gone so far as to question whether in terms of resilience "perhaps the social and psychological sciences should have created their



own language, free from inherited meanings” (Norris, Stevens, Pfefferbaum, Wyche & Pfefferbaum, 2008, p.128). On the other hand, it can be argued that no one owns the term ‘*resilience*’, and at the practical level, the concept of resilience has been researched and developed in a variety of fields.

Within the social sciences, resilience has also been defined in slightly different ways by different disciplines including developmental psychology, social work, and development studies (Adger, 2006; Chambers & Conway, 1991; Chenoweth & Stehlick, 2001; Kirmayer, Dandeneau, Marshall, Phillips & Williamson, 2011; Fromboise, Hoyt, Oliver & Whitbeck, 2006). Many of these include reference to ‘adaptability’ when referring to how individuals or communities cope with problems they encounter and the relationship between the two terms is dealt with below. Many social science disciplines such as psychology and social work have also developed their own yet similar definitions and seek to understand and apply the concept of resilience from their own perspectives. In this subsection these various definitions of community resilience are explored for the purpose of enabling a deeper understanding with reference to communities close to mining locations.

In social psychology, an ecological approach to resilience is applied and connects resilience to the psychological characteristics of individuals’ abilities to solve problems (Kirmayer, et al., 2011; Ungar, 2004). Developmental psychology and psychiatry were among the first to associate resilience to the personal characteristics of individuals. Psychology defines resilience in terms of a person’s personality and attitude in dealing with challenges in their lives. Studies on the resilience of youth in the face of adverse

life events such as psychological dysfunction indicated that teenagers with a higher IQ, strong family support and close family monitoring and supervision developed a higher level of resilience (Masten, et al., 1999; Tiet, et al., 1998; Tiet, et al., 2001). Using these ecological approaches to resilience the emphasis is thus on how behaviours are shaped from the inside (Ungar, 2004), regardless of external influences such as parental support. Recent studies on lessons learned from stress and trauma demonstrate the significance of levels of resilience in these victims (Lacoviello & Charney, 2014; Makkawi, 2012). A recent review of the work of Wilson (2012) on 'Community resilience and environmental transitions' by Robinson and Carson (2015) highlighted the position of an integrative approach including ecological, engineering and adaptive resilience which contributes to individual resilience. In community psychology resilience is connected with a person's sense of belonging to the community (Berkes & Ross, 2013; Chavis, Hogge, McMillan & Wandersman, 1986; Chavis & Wandersman, 1990; McMillan, 1996; Nystad, Spein & Ingstad, 2014; Sarason, 1974). Studies on community psychology found that community members identifying themselves through personal values such as religion and professional associations, belonged to more resilient communities.

Critiques of this social-psychological approach to resilience argue however that more emphasis needs to be placed on a person's ability to cope, adapt, or organise resources when confronted with hardships, and social-psychological approaches tend to neglect certain groups such as the disabled (Hutcheon & Lashewicz, 2014). The use of an ecological view of resilience is challenged by the constructivist interpretation that defines resilience in relation to the cultural environment of individuals, families and

the wider society (Ungar, 2004). Ungar (2008) further argues that resilience needs to be viewed in the context of the interactions of different factors such as the beliefs and values and other circumstances of a particular individual, a family and the community as a whole. The constructivist view defines resilience as an outcome of interactions among these various factors (Ebersohn, 2012; Hutcheon & Lashewicz, 2014).

Bottrell (2009) also argues that aspects of the social-psychological approach to resilience, such as the developmental and individual level of analyses, overlooks social inequalities. This argument is supported by the fact that policy approaches based on this understanding of resilience tend to overlook, for example, the mentally ill, or as mentioned people with disabilities (Runswick-Cole & Goodley, 2012) or the elderly (Wild, Wiles & Allen, 2011). That is groups whose needs differ from normative wider society. With reference to the abovementioned groups there is little consideration given to material resources and networks that can contribute positively by addressing the specific needs of these people (Runswick-Cole & Goodley, 2012).

In contrast to the social-psychological approach to resilience, definitions from within social work derive from the theories and frameworks that position individuals within a community with complex dynamic characteristics and their interactions are in response to risk factors such as socio-economic status, social and health problems and behavioural incompetence (Fraser, Galinsky, & Richman, 1999; Chenoweth & Stehlik, 2001). These definitions focus on the individual interacting with all other aspects of the social world such as available services and policies that regulate the provision of these services. This definition is further emphasised by The Canadian Centre for Community

Renewal which defines resilience as “the intentional action to enhance the personal and collective capacity of its citizens and institutions to respond to and influence the course of social and economic change” (as cited in Berkes & Ross, 2013, p.6). The intentional action here concerns the policies and plans formulated by the stakeholders to achieve tangible results such as the effective and efficient delivery of services in the community. This approach is of particular relevance to this research.

This more collective view towards community resilience is further elaborated as “the capacity of community members to engage in projects of coordinated action within the context of their community despite events and structures that constrain such projects” (Brown and Kulig, 1996, p.43). Recent resilience literature places greater emphasis on the positive impact of taking a more collective approach in understanding members’ capacity to building community resilience (Berkes & Ross, 2013; Lyon & Parkins, 2013; Poortinga, 2012; Shaw & Maythorne, 2013). This collective view relates resilience closely to the adaptation aspect of the ecological perspective as outlined above.

Building on this approach, community resilience can then be viewed as the development and engagement of existing resources in a community that is challenged by unpredictable changes (Magis, 2007). Folke et al., (2002) also emphasise the dynamic and unpredictable: one cannot be sure of what can take place in a community within a given period and resilience is important to ensure that this uncertainty can be turned around if there are to be significant plans to create opportunities to enable the people to achieve a higher level of community development. Blishen, Lockhart, Craib and Lockhart (1979) and Bowles and Cook (1981) developed a schema for understanding how

communities creatively cope with external influences. In using the case of health, Blishen et al. (1979) identified three dimensions of community health that can be influenced by externally driven transformations:

- i. social vitality which focuses on patterns of social behaviour representative of community health;*
- ii. economic vitality, the level of economic independence of regional, provincial or national economy; and,*
- iii. political efficacy which is concerned with how the mentioned dimensions associate with mobilizations of political power and its processes.*

They demonstrated the ways in which community resilience along these dimensions was affected among communities in different contexts impacted by forestry, fishing, and mining projects. A predictive study on social impacts in Broken Hill Mine in Australia, also found these three dimensions to be useful (Ross & McGee, 2006), with the first two dimensions being critical to shaping the resilience of the local community to deal with the downsizing of the mine, while the third one assisted in mobilizing the people's views on possible community transformation pathways.

These dimensions of community transformation appear to have helped the community at Broken Hill to recover from the multiple stresses that came with downsizing of the mine, together with the reconstruction of their relationships with other stakeholders (Ross & McGee, 2006). The interactions with other stakeholders are of paramount importance due to the fact that they are part of the whole operational system, and all groups have to co-function for the sake of the survival or continuity of the community. Again, this is of relevance to the situation experienced by mine-impacted communities in Papua New Guinea which is the focus of this research.

The strength and vitality of the community along social and economic lines at Broken Hill clearly demonstrates how this can affect their ability to absorb the rapidly changing situation and create opportunities to benefit their community in the longer-term. Absorption refers to the manner in which communities absorb stress or distress. In this stage the community is confronted with a problem or faced with a dilemma and may not know how to deal with the new situation (Kimhi & Eshel, 2009; Kimhi & Shamai, 2004). It can also represent situations where a community reacts and adapts to a disturbance brought upon by an activity such as mining and has to transform. Challenges encountered by a community can be from both within and outside the locality; however, the stressors are more often external. The resilience of a community is influenced by “globalisation and transitional pathways” (Wilson, 2012, p. 1218), which consequently affect national policies, which then trickle down to the delivery of services (including health) to the communities. Studies on international policies such as the Millennium Development Goals (MDGs) and health policies in developing countries illustrate there is often limited focus on local needs (Easterly, 2009; Clemens, Kenny, & Moss, 2007). A more resilient community will naturally find it easier to absorb outside stressors than a less resilient community. This approach then views the community as an entity with existing features and assets but with an unpredictable future (Davis & Franks, 2011; Folke et al., 2002).

Communities throughout the world are regularly confronted with a broad array of challenges instigated by factors beyond their control. In Australia for example, a literature review of resilience in rural communities discovered these communities are

challenged by political change, economic downturn and policy changes (McIntosh et al, 2008). Other communities such as the war torn ones in Lebanon showed that personal traits and human relations were crucial for those coping with the stress of violent conflict to recover (Kimhi & Shamai, 2004).

Resilient communities internalise the situation on hand, adapt to it, and then develop strategies to resist the challenges they encounter. Challenges are inevitable but their impact depends on the resilience of such communities to deal with their specific issues.

Resilience can also be closely linked, conceptually, to the original definition of sustainable livelihood security which is defined as:

*adequate stocks and flows of food and cash to meet basic needs. Security refers to secure ownership of, or access to, resources and income-earning activities, including reserves and assets to offset risk, ease shocks and meet contingencies. Sustainable refers to the maintenance or enhancement of resource productivity on a long-term basis. A household may be enabled to gain sustainable livelihood security in many ways - through ownership of land, livestock or trees; rights to grazing, fishing, hunting or gathering; through stable employment with adequate remuneration; or through varied repertoires of activities (Chambers & Conway, 1991, p.5).*

This definition covers a broad array of livelihood options with the understanding that it is about communities being able to maintain themselves in a consistent fashion. This definition covers the security of individuals, households (or families) and the community as a whole. The concept of sustainable livelihoods is further emphasised by other authors (Bacud, Cardenas & Velasco, 2014; Chen, Shivakoti, Zhu & Maddox, 2012; Sseguya, Mazur, & Masinde, 2009) specifically the experiential application of this

concept and its impact on people. Some recent studies (Bacud, Cardenas & Velasco, 2014; Hanazaki, Berkes, Seixas & Peroni, 2013) have also illustrated the connections between a sustainable livelihoods approach and the resilience of people and communities. This thinking also underpins this thesis.

The first half of the above definition clearly links to the earlier discussion of resilience. Development, in this context, is defined as “long-term transformation, improvement and continuous betterment of the livelihoods of people” (Cronje and Chenga, 2009, p.417) and is directly related to resilience as it focuses on how a community can cope with and recover from the negative impacts of different shocks or transformations. Importantly, from an operational research perspective, the sustainable livelihood framework is derived from the original work of Chambers and Conway (1991), however it was Scoones (1998, 2009), who further developed the idea of ‘assets’ (or capitals), which provides a basis for assessing the strength of different aspects of a community, and a parallel can be drawn here with the idea of community capitals (Aldrich, 2012; Poortinga, 2012; Ungar, 2011) as used in this thesis.

This view of sustainable livelihoods and community resilience provides a direct link to the discourse of sustainability typically employed by mining companies over the past two decades. Most mining industry definitions of sustainability, in relation to affected communities, view it as the realization of a net benefit, both during and beyond mine closure. It is also believed that the fostering of “sustainable mining communities and the role of community consultation and capacity building” (Veiga, Scoble and McAllister, 2001, p.191) is important to the industry. There is a large body of work (for example,



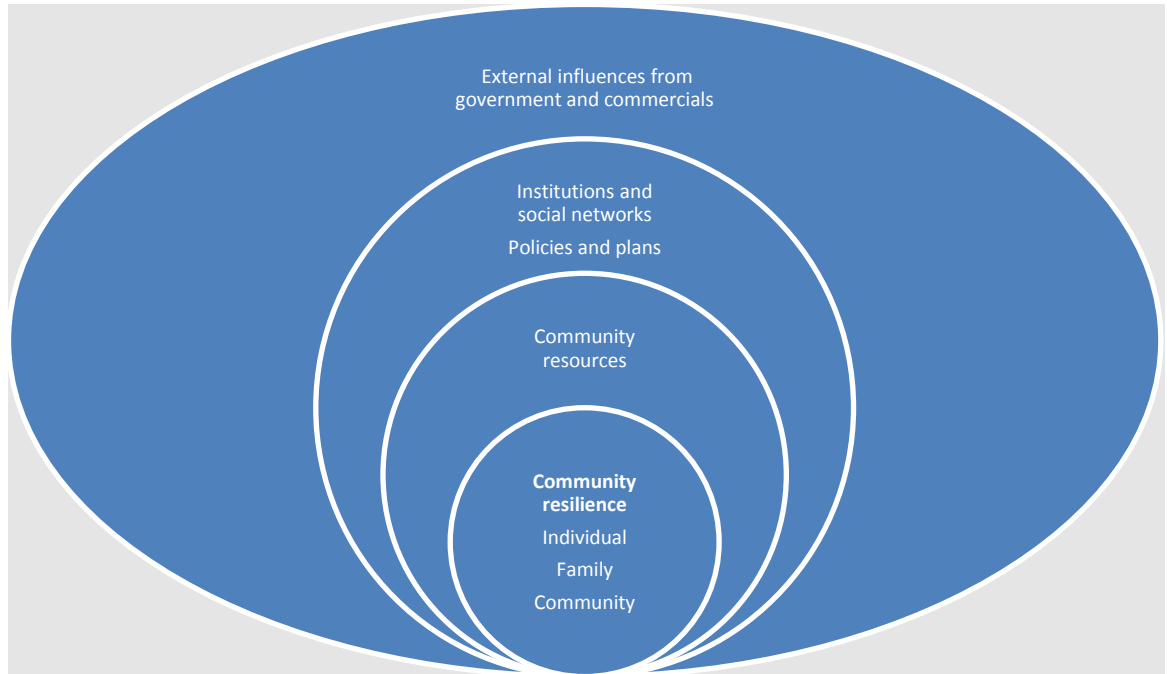
Bridge, 1999; Esteves & Vanclay, 2009; Nelsen, Scoble & Ostry, 2010; Schmidt, Hemingway, & Bellefeuille, 2012; Tse, Ran, Huang & Zhu, 2013) on the importance of building community capacity by strengthening the utilisation of community capitals to achieve community resilience (see Section 4.3). The mining industry often acknowledges the importance of building community capacity to produce more sustainable outcomes for these communities, and as will be discussed below, most of the companies aim to strengthen community capitals, and in part do so by trying to facilitate better and more effective service delivery in impacted communities. Plummer and Armitage (2007) argue however that a lack of partnership in the way the resources are managed to build community capitals can lead to less favourable results. Working in partnership successfully is dependent on the nature of the stakeholders and partnerships formed to support communities. The literature suggests that partnerships in community development need to include both internal and external organisations if resilient communities are to be built (Steiner & Atterton, 2014).

Given the above, Adger (2006) argues the importance of taking an integrated and holistic perspective when seeking to understand the practical applications of community resilience. This idea is further supported and developed by practitioners, researchers, and scholars who redefine resilience and apply it to their individual contexts, research or thinking. However, there can be challenges according to Gallopín (2006) in trying to understand the concept across different disciplines. Several authors like Folke et al. (2002), O'Brian et al. (2009), Norris, et al. (2008) and Adger (2000) concur that an inter-disciplinary approach is required to explain resilience because it is

such a complex concept that cannot be defined in isolation from other interrelated concepts.

### 4.2.3 Summarising the social perspective and community resilience nexus

The social perspective of resilience is most relevant to communities impacted by mining in PNG because it takes an integrated approach to understanding and thus building resilience in these communities. The work of Berkes and Ross (2013), provides an overview of the different factors which need to be considered when trying to achieve CR at the highest and most comprehensive level. Figure 4.2 illustrates the factors that influence the building of resilience in communities.



**Figure 4.2: Factors in building community resilience.**

Source: Adapted from Berks and Ross (2013, p.14).

In the terms of Figure 4.2, then, community resilience is a multi-dimensional phenomenon that is explained through the interaction of many factors which can impact positively or negatively on individual, family, community and organisational resilience both within and outside of the concerned community. Building community resilience is then a “long-term process that requires a holistic and integrated approach” (McIntosh et al., 2008, p.13). The strength of community resilience is dependent on the interactions of these related features, and building resilience in communities thus requires an integrated and collaborative approach to planning, and then the mobilising and implementing of these plans. Managing this involves engaging community members in the development and implementation of these plans, accompanying policies and programmes.

To be resilient, then, is to be able to recover, often after a rapid transformation of some sort that may be in the form of rapid or negative social change, shock or a dramatic event, such as that experienced by relocated households adjacent to large-scale mining operations (Bonnell, 1999). Resilience is the capacity to absorb dramatic change while maintaining functionality, and provision of opportunities to renew and reorganize a community within that context. It is also a concept that has been deployed and used at a variety of levels: from the individual to the family and the community, and although there are important distinguishing features at each of these levels, they are clearly related: resilience at the community level is affected by the ways in which individuals and families respond (in itself a function of the various community capitals). This is discussed in more depth in the following section.

### ***Individual***

Individual resilience focuses on personal traits (Kimhi & Shamaï, 2004; Kirmayer et al., 2011), and these traits determine how a person conducts him/herself in dealing with problems. These traits see individual resilience to be associated with psychological characteristics, such as “hardiness, flexibility, problem-solving ability, intelligence, sense of humour, and social skills” (Kirmayer et al. 2011, p.84). It can also include a person’s belief system and their skills and knowledge that can help them adapt to the changes that happen within their community that affect them. Individual resilience is seen then to be very important to the building of resilience in a community. In this context, the individual interacts with a number of other factors such as social networks, infrastructure and support services.

Human relations focuses on personal relationships and other social groupings or systems within a particular society and these play a major part in upholding individual resilience (Kimhi & Shamaï, 2004; Walsh, 2003). Individuals need support from systems within their environment to build the level of resilience they need to survive and contribute to their respective communities. A global study on youth illustrated there is a specific relationship between tension and resilience (Ungar, 2008, p.215). Youth with a high level of resilience resolved tense issues and situations more easily. Studies on children, adolescent and youth thought to be exposed to risks, placed under positive youth development programmes, displayed positive outcomes (Reivich, Gillham, Chaplin, & Seligman, 2013; Sesma Jr, Mannes, & Scales, 2013). It is thus difficult to build community level resilience if individuals in the community do not have the

appropriate level of resilience and capacity to cope. Byford (n.d) illustrated that in Misima (one of the communities examined in this study), the individuals' low self-esteem led to their inability to deal with challenges, such as no income after mine closure. Despite the significance of individual resilience there is limited literature on individuals and their interactions at a wider level, for example in terms of family or community level resilience, in mine impacted communities (see Haro, 2010).

### ***Family***

Understanding individual resilience is important because it impacts on family resilience, which further contributes to building resilience at the community level, and vice versa. A resilient family will most likely foster resilient individuals as is to be noted below. With respect to the individual, a person's ability to deal with unexpected or stressful issues can also be determined by how the individual commits to the family values, beliefs, culture and other aspects that in turn also suggests what they may contribute to the building of community resilience (Hawley & DeHaan, 1996; Walsh, 2013). Hence individual resilience contributes to "effective family functioning" (Walsh, 2003, p.1). Families in mining communities in Papua New Guinea are confronted with multiple social pathologies such as domestic violence, alcohol abuse and an increase in sexually transmitted diseases including HIV/AIDS (Hammar, 2010; Johnson, 2011), which can test the level of family resilience. In order to build a community's resilience, individual and family resilience must be supported.

As mentioned studies from various contexts have found that family resilience is significant to the building of communities (Hawley & DeHaan, 1996; Walsh, 2013). Resilient families are better able to contribute to community development. Therefore, both individual and family resilience are complementary to the building of community resilience. Literature on individuals, especially youth, show that family structure plays a vital role in building resilience in children (Masten, et al., 1999; Morrison, Nikolajski, Borrero, & Zickmund, 2012; Okvat & Zautra, 2011; Tiet, et al., 1998; Tiet, et al., 2001). Family support is important in shaping a person's conduct in terms of defining resilient behaviour.

### ***Community***

Literature on the concept of community has been written from many perspectives, consequently several different meanings of the concept have emerged. Social scientists attempt to define the concept in relation to people and their geographical boundaries (Newman & Paasi, 1998). A community is further defined by MacQueen et al. (2001) as a group of people with different characteristics who are connected by social relationships and share similar perspectives and participate in their respective geographical locations.

The concept of community is commonly used by politicians and policy makers to deliver messages or services to social groups and promote the development of regions or societies. In 1977 Seymour Sarason outlined the psychological sense of community (*PSOC*) to include: (i) Belonging, (ii) Fulfilment of Needs, and, (iii) Influence. Later Obst, Smith and Zinkiewicz (2002) added the notion of connections; consequently,

researchers, academics and practitioners have used combinations of these terms in different contexts (Chavis & Wandersman, 1990). Social community has been defined by many through the idea of sense of belonging (Chavis et al., 1986; Chavis & Wandersman; McMillan, 1996; Sarason, 1974). This sense of belonging concerns an individual, a family or a community identifying themselves with certain values and norms of a social group such as a women's group, a church, or a professional association. In other words, a community is made up of people with a common understanding on specific issues. A recent study (Friggeri, Lambiotte, Kosinski & Fleury, 2012) around personality traits such as extroverts' behavior on social media revealed individuals with outgoing personalities more easily build connections between different communities. This concept was also elaborated by Obst et al., (2002) who developed the notion (connected to Sarason's work) of a dimension labelled Conscious Identification. Conscious Identification is separate from the former elements of PSOC, and integrates demographic characteristics of regions and rural communities, and also seeks to link in the influence of the physical settings of a community. This is useful for those communities located within and around the mining leases of the large-scale mines as these physical locations do influence people's sense of belonging in their natural environment as well as with each other (Halvaksz, 2008).

These social and geographical perspectives interact, and thus it can be difficult to strictly separate their definitions within the concept of community. Individuals may belong to multiple social or geographic communities at one time. It is also important to understand how communities respond to change and create a framework for exploring the impact of large-scale mining on them, and this is done below, after summarising

the above discussion of resilience and producing an operational definition of community resilience that will be used in the rest of this thesis.

#### **4.2.4 Operational definition of community resilience**

The definition of community resilience in the context of mine impacted communities used in this thesis is an integration of several of those put forward above (Berkes & Ross, 2013; Kulig et al., 2008; Magis, 2010). The integrated operational definition of community resilience for this study is:

*The ability of communities to respond and adapt after disturbance through learning and collaboration with all relevant stakeholders, and strategic planning at local and national levels to maintain, measure, and strengthen community capitals, and hence achieve sustainability.*

This definition has four key elements that feed into the research that follows: first is the notion of adaptation to disturbance and change, second is the significance of learning and collaboration and planning, third is the element of planning for mobilisation and implementation, and fourth is the measuring of community capitals and resilience so as to ultimately build more sustainable communities. The four parts of the operational definition of this study are worked through in Section 4.3. The operational definition for this study is further supported by Magis' definition which views community resilience as "the existence, development and engagement of community resources to thrive in a dynamic environment characterized by change, uncertainty, unpredictability and surprise" (2007, p.10). This definition emphasises the utilisation of existing resources to minimise uncertainties in the communities, and is again derived from the constructivist approach. The community capitals as presented below in Section 4.3



emphasise the importance of adopting a holistic approach to the building of community resilience in mine-impact communities.

### **4.3 Achieving sustainable communities by strengthening community capitals**

Drawing on the above operational definition of community resilience this section analyses the interaction between the community capitals in building resilience through the delivery of health services, and hence achieve more sustainable communities. Community capitals refer to the assets and resources one can find in communities (Magis, 2007), including through being impacted by mining, all of which can contribute to the building of community resilience. There is a large body of work on the contribution of the various community capitals for achieving sustainability. Emery and Flora (2006), Flora and Thiboumery (2005), Magis (2010), Jacobs (2007) and McIntosh et al. (2008), Farmer, Prior, and Taylor (2012) all argue that a conceptual framework based on community capitals can be used to analyse community change and development, and they demonstrate also how the development of community capitals can contribute to livelihoods which are also sustainable within communities (Sseguya et al., 2009). Moreover as will be shown community capitals also have a bearing on the health status of individuals and indeed how individuals assess and or understand, for example, their own physical or emotional health (Rose, 2000). Health outcomes for individuals who had stronger social capital, for example, are better (Rose, 2000); thus it can be argued they are more resilient. Improvements in community capitals can therefore contribute to building resilience of the community. In the subsection below, parts of the operational definition of community resilience, including adaptation as

community response to change, collaboration and planning, mobilisation and implementation, and measuring community resilience are discussed to further understand the significance of community capitals.

#### **4.3.1 Communities' response to mining: adaptation and change**

Mining operations can bring significant changes to the host communities (Davis & Franks, 2011) causing them to adapt, negatively or positively to these changes. The responses and adaptations of communities to mining operations vary significantly depending on the way a particular mine operates, and the pre-existing state of the community. Literature on the impact of mining in host communities often emphasises the destruction caused by mining operations on the indigenous communities (O'Faircheallaigh & Gibson, 2012). The destruction which can occur is multifaceted consisting of both physical and social aspects and can include damage to rivers, economies and culture (Davis & Franks, 2011; O'Faircheallaigh & Gibson, 2012). For example, dumping waste into the river systems and the relocation of villages, as was the case in Ok Tedi, PNG (Hettler, Irion & Lehmann, 1997; Hilson, 2002) and Porgera (Johnson, 2011), put pressure on the livelihoods of the indigenous communities. The dumping of waste by the Ok Tedi mine into the river caused significant environmental damage (Hettler, et al., 1997). Sedimentary deposits contributed to slowing down the river flow and there were changes in the biomass and other biological features of the fish (Smith, Ahsanullah & Batley, 1990; Swales, Storey & Bakowa, 2000). Loss of land due to flooding and sedimentation, and the poor condition of land meant that there was less land for planting or crops no longer grew as well, and this contributed to food

shortages. These activities caused the indigenous communities to look for ways to adapt and respond to changes (such as overcrowding at destinations caused by migration away from land-poor areas) but often attempts to adjust were difficult, and resulted in other economic and social problems such as poor environmental health, increased alcohol consumption, and increased violence (Gilberthorpe & Banks, 2012; Jell-Bahlsen & Jell, 2012; Kepore & Imbun, 2011).

Indigenous populations can also face challenges in adapting to the increasing population from the influx of people in search of employment and business opportunities in mining communities. Looking to protect opportunities which become available due to the mining operation, landowners have sought to set up agreements regarding employment and/or other benefits so as to advantage themselves – such as demanding a share of migrant employee wages, for example (Bainton & Macintyre, 2013a; Filer & Macintyre, 2006; Johnson, 2011; Johnson, 2012). The actions of the landowners is one such example of the indigenous populations of mining operations seeking to adapt and respond to the changes the mining industry had brought upon them. Yet the impacted communities can most effectively adapt well and demonstrate resilience by collaborating and working with other partners.

### **4.3.2 Collaboration and planning**

Collaboration is understood to be two or more partners working together to achieve a shared goal (DeChillo, Koren & Schultze, 1994) and in this study it refers to working partnerships between relevant stakeholders such as the government, the mining

company and the community members where they interact to plan and deliver services such as health. It is important for stakeholders to collaborate and plan to contribute most effectively to overall community development. Networking and planning include the formulation of aligned and integrated policies that focus on the capacity building of the concerned community. Several studies (Foster-Fishman, et al.,2001, and Steiner and Markantoni, 2013, *and* Whittaker et al.,2012), which all focus on health, highlight the importance of building collaborative civil alliances among partners as it is this which contributed to positive results in the health status of the target communities. Capacity building in these contexts was done in a holistic fashion and included aspects such as physical infrastructure, human resources and economic aspects of development. This idea is further extended where disadvantaged poor communities also need “social networks and social capital” (Cattell, 2001, p.1501), as these too are significant for building the capacity of a community and the effective and efficient implementation of community plans. Building of social capital may also require the empowerment of the relevant community partners before they are able to participate in building their community capacity. In this way, the collaborative building of social capital contributes also towards the building of community resilience.

Literature illustrates that social support and networking is very important in planning for resilient communities (Mills, et al., 2014; Norris, et al., 2008; Olsson, Folke & Berkes, 2004; Plough, et al., 2013). Networking and planning involve the mine impacted community collaborating with other relevant stakeholders (state, NGO, company) and planning for how this community will strengthen its ability to withstand current and future disruptions. In the delivery of effective and efficient health services it is important

to have social support systems and networks (Poortinga, 2012) so that community members are able to liaise and plan not only with other stakeholders, but ensuring also that they can plan for ease of service access beyond mine closure.

While there are often numerous plans for local sustainable development that emanate from the mining companies (Franks & Vanclay, 2013; Veiga, Scoble & McAllister, 2001), Mate (2001) found that the policy frameworks formulated by government and mining companies on community services showed little evidence of planning for the sustainability of services (including health) beyond mine closure. If planning does occur, literature (Bice, 2013; Fitzpatrick, Fonseca, & McAllister, 2011; Standing & Hilson, 2013) confirms that there is even less evidence that government and mining companies do so in partnership. Governance issues mean host countries often struggle to ensure big organizations such as mining companies enact Corporate Social Responsibility (CSR) policy and/or undertake monitoring (Slack, 2012, Banks et al 2013). Moreover whilst government surveillance can pressure the developer to deliver services in the affected communities, the implementation can go awry if globally standardized services fail to address the specific needs and priorities of the concerned communities. This in turn undermines the building of community resilience which can result in the absence of sustainable services, including health, for these communities.

In summary, there is support for developing community capitals among various communities impacted by mining so as to sustain the delivery of services (Mate, 2001; Moran, Franks & Sonter, 2013; Muthuri, Chapple & Moon, 2009; Rispel, Padarath & Walt, 2011). Developing community capitals, such as social capital (Nelsen et al, 2010),

establishing mutual trust and networking, working in partnership (Rispel et al., 2011), and ensuring community participation (Muthuri et al., 2009) are fundamental. While it is also suggested that social capital (networks and working in partnership to plan and implement) can “enhance the health and resilience of these communities” (Nelson, Scoble & Ostry, 2010, p.172), the literature does not directly refer to how these capitals can contribute to the building of resilience or to sustaining health services. Thus there is a need for further investigation into the place of community capitals in building resilience in mine-impacted communities, and how plans made with or without collaboration can better sustain communities. The next subsection defines mobilization and implementation as these also relate to the operational meaning of community resilience.

### **4.3.3 Mobilization and implementation**

Mobilization and implementation are concerned with how community members seek to organise to contribute to the development projects and activities within their community. This is when social capital operationalises and there is networking of people and resources to build the capacity to implement plans, ensuring that services are delivered and sustained across all stages of mining. Mobilisation and implementation refers to the capacity of community members involved in identifying and coordinating activities, despite structures such as gender inequalities that may prevent effective participation (Chenweth & Stehlik, 2001). Thus, understanding the mobilisation of community members is also important for identifying the strengths and weaknesses of social capital within a community.

For implementation to occur, a community requires building not only collaborative capacity but doing this in an integrated manner. Speaking to this issue of integration, *Yeatman & Nove*, (2002) show that when the skills of people are developed in alignment with policies there is better engagement by the relevant authorities to deliver appropriate services and programmes. The implementation of a framework for capacity building to achieve, for example, health promotion, works much better when it is underpinned by “partnership, leadership and commitment” (*Yeatman & Nove*, 2002, p. 341).

A study by *Chavis and Wandersman* (1990) revealed that social relations are a significant factor in building community resilience (see also *Brodsky & Cataneo*, 2013; *Christens*, 2012; *Perkins, Hughey & Speer*, 2002). Studies in the United Kingdom expound on the building of resilience as achieved through factors such as “community engagement, empowerment, asset ownership and capacity-building” (*Steiner & Markantoni*, 2013, p.2) with the support of relevant public policies. Public policies thus play a very important role in empowering community members’ participation in community development because they are formulated with the intention of positive outcomes in building resilience. The effective implementation of policies and plans requires the engagement of community members to execute these plans.

Education can inspire and broaden the understanding of members who positively contribute to the building of resilience in their community. Education plays a big part in increasing community members’ literacy and numeracy skills enabling them to then capitalise on opportunities such as employment or spin off businesses, and effectively

access available health services. A study by Estacio (2013) on health literacy and community empowerment revealed that developing a better understanding of issues such as social and economic factors impacted on the delivery of health services. Low literacy skills consequently created complications in understanding the purpose or availability of necessary services. Another study on empowering women to participate in health care projects, clearly demonstrates the success of women having easy access to health services after they were made aware of the importance of the particular health services, via health literacy (Manderson & Mark, 1997). This shows that awareness was used as an important tool to create an understanding and appreciation of the access to health services and thus build community resilience.

On the other hand, not all policies empower citizens because some policies, and the roles played by the different institutions, disempower community members from active participation (Toomey, 2011). Also in many instances the community members are never consulted prior to the policy formulation process. Policies are typically made by agents who do not live in the communities that the policies are targeting for development; consequently this can create unfavourable results to which community members are subject, as they will remain in their community regardless of the results of the policies' implementation processes.

#### **4.3.4 Measuring community resilience**

The measuring of community resilience is important to this study, and indicators will be used to assess levels of specific aspects such as health or education within a particular context. This will be done so as to determine the effects of mining and the



strength of a community to withstand challenges such as disturbances brought upon by changes or disasters. Community resilience can be measured through a variety of approaches including areas such as policy implementation and disaster recovery (Javernick-Will, Jordan & Amadei, 2012; Kafle, 2012; Tierney, 2003). In this study, proxy indicators will be identified to measure the level of resilience in the affected communities. Studies on measuring the delivery of health services (Aletras, Kontodimopoulos, Zagouldoudis, & Niakas, 2007; Kontodimopoulos & Niakas, 2006) demonstrate the significance of using indicators. These criteria can be measured through the community capitals framework to determine the level of resilience that can contribute to the sustainability of effective and efficient delivery of services in all stages of mining. A review by Robinson and Carson (2015, p.1) on resilient communities strongly supports the measuring of resilience through a community capitals approach. This further allows McIntosh et al (2008) to propose a four pronged community capitals framework — i.e. comprising human, social, financial and natural elements to be used to plan and develop communities confronted with challenges. McIntosh et al. (2008) also showed that indicators from these four capitals can be measured. Research on measuring adaptive capacities by Norris et al (2008) stressed the importance of including social capital as a measure of resilience, which the above-mentioned model does. Measuring community resilience (see Chapter 5) also requires having an understanding of the relationship between the community capitals.

To understand communities in a holistic fashion, the linked concept of community empowerment is also important to building and measuring community resilience. Community empowerment is also defined as “the creation of sustainable structures,

processes, and mechanism, over which local communities have an increased degree of control, and from which they have a measurable impact on public and social policies affecting these communities” (Craig, 2002, pp. 125-126). Craig’s definition refers to frameworks such as policies and plans put in place to direct and coordinate community development in a positive manner. These are generally long term plans that can take years of implementation to achieve the desired results. This definition also emphasises the measurement of the results of policy implementation, as these measurements are necessary for revealing the extent of success and failure of the policies. For example, studies measuring the change achieved through the implementation of the multiple policy approach on community engagement and empowerment support the importance of the inter-connectivity and integration of local and regional area policies (Steiner & Markantoni, 2013). In another case, an evaluation of empowerment and participation in health promotion in Australia revealed that the extent of authorities’ resistance towards empowerment caused challenges in accessing continuing funding (Brandstetter, McCool, Wise & Loss, 2012).

The measurement of community resilience is important to this study. As a means to do this, there is a need to assess the effects of large-scale mining at the different stages (construction, operations and closure) on the community capitals, the delivery of health services, and ultimately, community resilience. Measuring resilience, and changes in it, can be difficult. The challenge of developing standard metrics to assess resilience (Cutter, et al., 2008) is compounded by the fact that “there is a lack of practical tools and assessment methods to capture aspects of change” (Steiner & Markantoni, 2013, p.1). This is further complicated by the range of perspectives on the

quality, and the strength of services that are delivered, and whether these services can be sustained across all stages, including after mine closure. Despite the difficulties, though, it is necessary to develop a framework which can be adapted to apply in specific contexts, such as the communities affected by mining that are the subject of this research. This is done in Chapter 5.

The above operational definition of community resilience informs the theoretical basis of resilience in relation with the delivery of health services in communities impacted by mining. The delivery of health services in these communities plays an important role in a country. Developed countries like Australia, Scotland and Canada implicitly regulate resilience via policy frameworks and through service delivery (in areas such as health) in comparison to developing countries such as Papua New Guinea and Solomon Islands. The delivery of health services in the latter instances has been a challenge (as noted in Chapter 2). Health service provision has at times been used conditionally and as a negotiating tool regarding benefit sharing agreements between the developer, government and landowners, as demonstrated in chapter three.

There is some work by other authors including Feeny (2014), Ratuva (2014) and Shuermann (2013) on resilience in Melanesia and the South Pacific, however, not in the building of resilience in the mining communities. For a range of reasons discussed below it is important, therefore for this study to propose a 'Bilum Framework' to address the question of resilience because this will provide an avenue to approach community building in a holistic, more Melanesian manner. It is important to view the delivery of health services in the context of the Bilum Framework so as to enhance

understanding and provide a more indigenous view of impacts of mining, and its effects on communities and community capitals. The delivery of health services will be employed as an area in which to measure and assess the effects on community resilience in terms of the desired, sustainable outcomes and outputs. Proxy indicators for each of the capitals within the Bilum Framework will be developed and used to measure the levels of resilience in each of the mine-affected communities.

#### **4.4 The Bilum Framework**

The 'Bilum' in Tok Pisin is a traditional bag knitted by hand and is used as a metaphor for the conceptual framework for this study (Franken & August, 2011). The Bilum metaphor is developed and applied to explore the interactions of capitals in building resilience in the selected PNG mining communities.

In the past the Bilum were used mainly by the people in the northern part of the mainland of the country (German New Guinea during the colonial administration). Today, it is widely identified as an important cultural item across the MOMASE region (made up of Morobe, Madang, East Sepik and West Sepik (now called Sandaun) Provinces), and the Highlands region (which consists of Eastern Highlands, Western Highlands, Southern Highlands, Enga, Simbu, Jiwaka and Hela provinces, and the Eastern part of Indonesia (Irian Jaya or West Papua). Studies (D'Alessandro & Hellmich, 2008; MacKenzie, 1991) confirm the significance and important place of the Bilum in these societies due to its cultural connections and meaning, as well as in terms of the

different activities it is used for, such as carrying children, transporting goods and garden produce, and securing important personal items.

Hence the Bilum is used in many ways, with these uses determined by the style, size and the meaning it is given depending on the context. The importance and multiple uses of the Bilum include the “role of container, baby carrier and cradle, pocket, quiver, attire, dancing regalia, ornament, amulet, toy, trade commodity, wealth item, marker of identity, spirit catcher, shrine, and sources of all cultural resources” (Mackenzie,1991, p.6). The different uses are also associated with different cultural practices such as healing illnesses, bride price payments, traditional dancing and peace-making ceremonies. Traditionally, the Bilum was looped mainly by women from different natural fibres, with the specific fibre types varying by community. In the past, only bush ropes and cuscus fur were used in its production, but these days brightly coloured wools, and other twine and string are utilized as alternatives. Figures 4.3 - 4.8 below provide some illustrative examples of Bilum use in differing cultural contexts in PNG. While communities in specific regions traditionally made different styles of Bilum for a range of purposes, in contemporary PNG, the Bilum continues to be a multi-purpose item for people and it is now used all around the country.



**Figure 4.3: Bilum as a baby carrier**  
Source: The PNG Bilum, Facebook, (2014).



**Figure 4.4: Bilum as a bag**  
Source: The PNG Bilum, Facebook, (2014).



**Figure 4.5: Bilum as cloth.**  
Source: The PNG Bilum, Facebook, (2014).



**Figure 4.6: Bilum as dress and bag.**  
Source: Tekwie (2011).



**Figure 4.7: Bilum as cultural symbol.**  
Source: The PNG Bilum, Facebook (2014).



**Figure 4.8 Bilum as dance –wear.**  
Source: The PNG Bilums and Baskets (2015).

The analogy of the Bilum is used in this thesis to illustrate critical aspects of the community capitals approach to the building of community resilience. In particular it talks of the need for holism when exploring the effects of large-scale mining on community resilience. The whole structure of the Bilum operates in a holistic fashion; a lack of maintenance or the breakdown of one part of the Bilum will have a negative impact on the other parts of it, mirroring the idea that community resilience depends on the strength and integration of the system as a whole (Magis, 2007). So, for example, when one part or corner of the Bilum is damaged, the whole Bilum will lose its strength, especially when carrying heavy loads. And likewise, a lack of maintenance will mean it is less attractive and useful as a ceremonial item.

Only three different uses: a carrier, clothing, and traditional dancing costume are demonstrated in Figures 4.3- 4.8. As noted, it is also used as a trade item, a component of traditional healing processes, a marker of wealth, and of political status. As such, the analogy of the Bilum relates to aspects of the community capitals approach to the building of community resilience. Figure 4.9 presents the proposed Bilum Framework for this study.

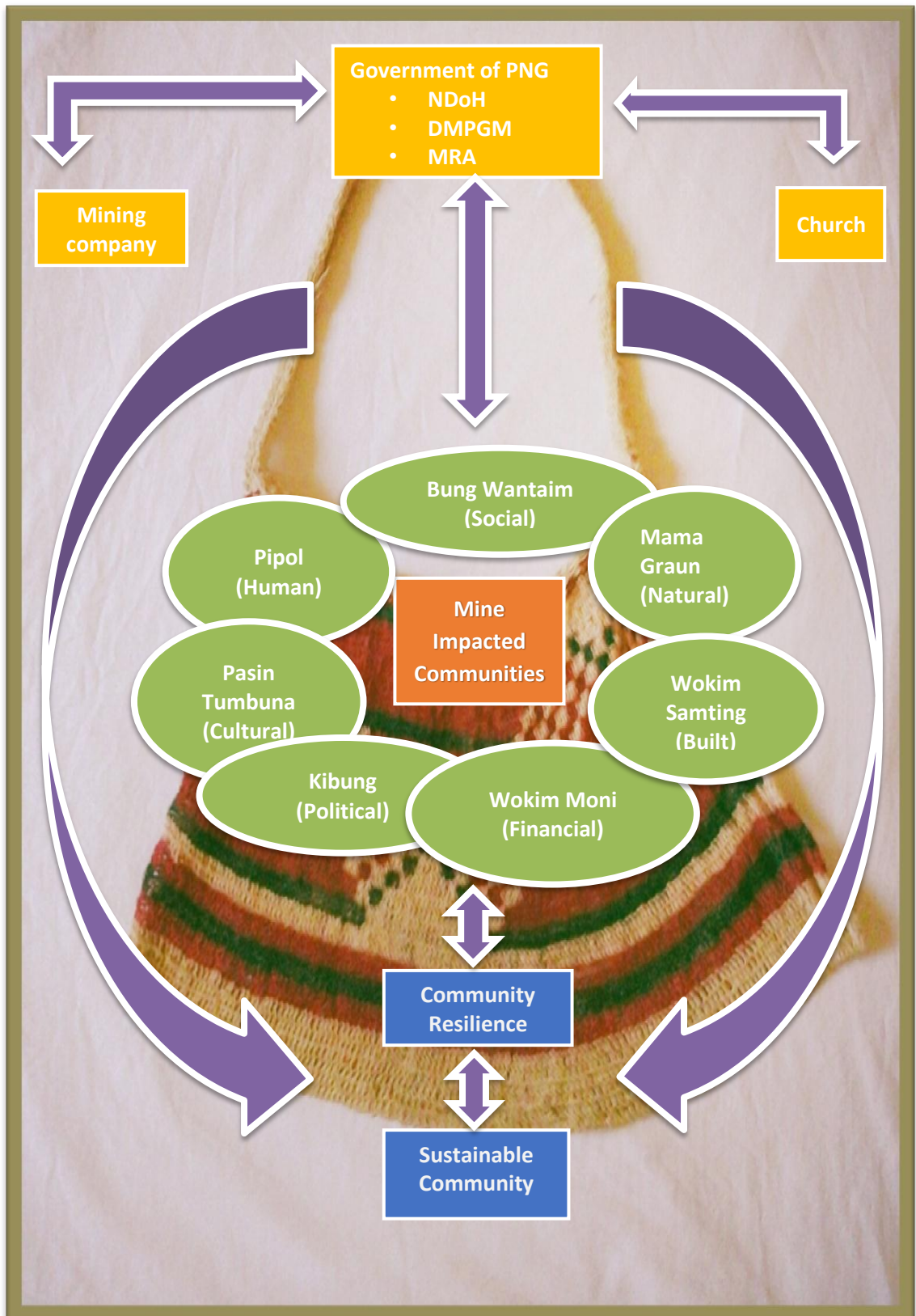


Figure 4.9: The Bilum community capitals framework

Source: Adapted from Flora and Thibourmery (2005).



The Bilum Framework views the building or undermining of community resilience in a holistic manner: the linked capitals — the Bilum — will be weakened if any one of the capitals is undermined by an external intervention. Community development and capacity building under this framework needs to pay attention to all aspects of livelihoods and development (McIntosh, et al., 2008). The achievement of sustainable and more resilient communities requires recognition of the multi-dimensional nature of the community capitals and resilience itself. In this sense the Bilum Framework mirrors the community capitals approach towards building community resilience (McIntosh, et al., 2008), and also parallels the concept of Kete, the framework of Māori baskets of knowledge in New Zealand (Connolly, 2007; Karetu, 2010). The Kete weaves together a framework of knowledge which is applied in practices such as child welfare (Connolly, 2007). The emphasis on the development and application of the community capitals approach is proposed so as to ensure that the specific areas categorised under each of the capitals are actively considered and where needed further developed in order to sustain services and strengthen community resilience. The main focus of the Bilum Framework is on how the interaction of the four key stakeholders: the GoPNG through the DMPGM and NDoH, the Churches, the Mining Companies, and the communities either strengthen or weaken the various community capitals, and hence affect community resilience (Berkes & Ross, 2013). The collaboration among stakeholders and the development of capacity — particularly at the local level — are all important components of the approaches that stakeholders adopt to strengthen the existing community capitals. The Bilum Framework provides a framework for discussion for this thesis and will enable a better understanding of the problems involved in the building of community resilience and the challenges involved

in doing so. It aims also to provide a means of understanding the need for and forms of collaboration of the relevant stakeholders in formulating integrated policies in order to achieve more resilient and sustainable communities, in part through the contribution of effective and efficient delivery of health services during all stages of mining.

The Bilum Framework is multi-dimensional in its approach, and is composed of three components. The first are the stakeholders comprising GoPNG, the Mining Company, Churches and the communities as outlined in Section 3.2. Secondly, the seven community capitals (in Tok Pisin with their English version in brackets): mama graun (natural), pipol (human), wokim moni (financial), Pasin Tubuna (cultural), bung wantaim (social), kibung (political) and wokim samting (built). Together the application and work of the stakeholders on the seven capitals leads to potential sets of outcomes, the third component of the framework. In terms of the normative ideal, this third component will consist of developments in the delivery of health services which strengthen the various community capitals so as to achieve a more resilient and sustainable community. The outcomes of the interaction between the first and second levels (the stakeholders and the capitals), contribute to the third element: the building or weakening of resilience, and ideally, the sustainability of effective and efficient health services that will in turn achieve more resilient and sustainable communities.

This study attempts to understand the importance and positive contributions of an approach based on the concept of community capitals to facilitating relevant, effective, efficient and sustainable delivery of health services in PNG's mine-impacted communities, and to the sustaining of high levels of service provision to these mining

communities. It aims also to understand the collaboration of the relevant stakeholders in formulating integrated policies in order to build this community resilience, in part by ensuring the sustainability of effective and efficient health services across all stages of mining.

## **4.5 The community capitals within a Bilum Framework**

This section introduces each of the community capitals, highlighting the culturally-grounded nature of their origins and application in the Papua New Guinea context. The seven community capitals; mama graun, wokim moni, Pasin Tubuna, bung wantaim, kibung, and wokim samting, are each introduced and explained from a Melanesian perspective, and elaborated in terms of their roles in the understanding of the Bilum Framework.

### **4.5.1 Mama Graun (Natural Capital)**

Mama Graun is concerned with the physical environment and the resources it contains. Land is very important to the traditional subsistence lifestyle and livelihoods in Papua New Guinea, as noted in Chapter 3. The clan territory is the area in which people garden, fish, hunt, access water, as well as depending on it for the herbs they use for healing purposes (Halvaksz, 2008). Almost everything they need is accessed from the land. Changes to natural capital can have a flow-on effect to other community capitals, such as a loss of forest which can reduce access to traditional healing herbs. Mama Graun also includes natural resources such as water ways, soils and minerals, and also takes account of the relative remoteness of each of the

impacted communities (Emery & Flora, 2006). These in different ways contribute towards how the local population views the environment and deals with the effects of large-scale mining (Halvaksz, 2008). Mining operations can alter the physical environment in several ways (creating large excavated holes, constructing waste dumps and areas for infrastructure, and polluting water and air) which can destabilise the livelihoods and capitals of the indigenous populations and their existing patterns of life and, in most cases, leave the community in a worse state than prior to mining operations. A study by Johnson (2011), for example, indicated that women within the Porgera community also are struggling to access safe drinking water and sufficient land to continue gardening.

Mining companies tend to focus on economic growth and overlook the impact of their effects on natural capital, as well as the other community capitals (Bury, 2004; De Graaf et al., 1996; 2002; Kepore & Imbun, 2011). Recently however, more companies have sought to mitigate at least some of their effects on the natural environment by establishing initiatives such as land reclamation, aquaculture and ecological restoration that can positively affect natural capital and contribute to the building of resilience in these communities (Otchere, Veiga, Hinton, Farias & Hamaguchi, 2004; Xiao, Hu, Li, Zhang & Hu, 2011). In PNG, the closure of the Misima mine was accompanied by attempts to restore some of the land affected by mining, but it does not appear to have contributed greatly to community wellbeing (Byford, n.d.). This is discussed in detail in later Chapters. Rehabilitation at other mine sites in PNG including Porgera (Coumans, 2011; Macintyre, 2015) and Ok Tedi (Kepore & Imbun, 2011; Kirsch, 2007) similarly has not been adequate to restore *mama graun* to support livelihoods. Land

and bush and forest on it play a significant role in health by providing the traditional herbs and medicines that the local people have traditionally used to heal their illnesses. In relating the Bilum Framework directly to mama graun, natural fibre is taken from the special plants that are extracted to weave the Bilum (MacKenzie, 1991).

#### **4.5.2 Pipol (Human Capital)**

Pipol is concerned with the attributes of individuals that enable them to contribute effectively to building resilience in their communities. These abilities include their health status, and the skills and knowledge acquired through education and training that can be utilised to build resilience (McIntosh, et al., 2008). It also includes individuals' levels of empowerment that enable them to lead and strengthen community organisations (Israel, Checkoway, Schulz & Zimmerman, 1994). A study by Steadman, Parkins and Beckley (2004) of resource dependent communities in rural Canada shows that low levels of human capital do impact on the opportunities and constraints that individuals and their families face, with lower levels of education determining how they look for alternatives to improve their lives. A recent study (Tremblay & Gutberlet, 2012) on the empowerment and participation of recyclers in decision making contributed to positive community and organisation building.

Consequently, the health of a person and their level of education, knowledge and skills influences how the individual can approach and respond to difficult situations and shocks in their community. Additionally, low levels of pipol can be expressed through

people lacking the relevant knowledge and skills to care for the sick and the vulnerable. Essentially healthy and better educated communities are more able to respond and adapt to change, and typically are better able to collaborate and participate in the delivery of appropriate and sustainable health services (Hawe, Noort, King & Jordens, 1997; Marten, 2012).

A lack of funding to provide training and relevant skills so as to create a better understanding of health issues also contributes to the challenges experienced by community members. This situation is further complicated by lack of functional literacy skills. In PNG, levels of functional literacy are very low (Thiele, 2013, p. 30). This, for example, can impact on a mother's understanding of basic instructions about how to feed an infant, as well as ensuring the baby is healthy.

Pipol, then, does affect the capacity of a community to withstand dramatic transformations. The capacity of community members involved in identifying and coordinating activities, such as health service delivery, despite obstacles to the effective operations of such activities, is an asset in building community resilience (Chenoweth & Stehlik, 2001). For this to occur, though, requires that the human capital within the community is educated and empowered. In order to knit a Bilum, the women and men need skills to carefully examine and weave the Bilum that is relevant for a specific purpose. As MacKenzie (1991) illustrates, the Bilum is constantly understood to be woven for special occasions by specific people with special skills. This represents the various skills people acquire to contribute to the different community capitals in building community resilience in the mining communities.

### 4.5.3 Wokim Moni (Financial Capital)

Wokim Moni refers to the availability of financial resources both within and outside communities that could be utilised towards the building of resilience in a community (Emery & Flora, 2006). It includes funding the community may have access to, the provision of relevant health services from the multi-national mining companies, the government, and other organisations. As discussed in Chapter 3, these revenue sources can be diverse and significant. For example, landowner equity in the mine operation is one form of financial capital that is available to mine-lease landowners, alongside considerable sums of compensation and royalty monies. In PNG, dividends from the landowner equity are paid mainly to the owners of the land leased for mining through landowner companies after negotiations and agreements decided at the Development Forum (see Chapter 3). This identifies several of the key issues with wokim moni, including the need for appropriate structures to manage and equitably distribute these flows, and the need, as Banks (2003) outlines, to ensure that these flows contribute to local forms of sustainable development that can move beyond the current minimal impact on local community development. Currently as discussed in chapter 3, the structures and instruments utilised to manage and distribute revenue streams are locally oriented and not transparent, which raises concerns regarding their effectiveness in improving the overall long term development indicators of the affected communities.

Problems can also arise around wokim moni due to the ways in which economic factors are embedded in the socioeconomic and political understanding in the Melanesian

context, particularly with reference to the concepts of local ownership and identity (Banks, 2005; Jorgensen, 2006; Macintyre & Foale, 2002). Hence there have been many conflicts over what the 'correct' benefit sharing arrangements should be for each specific community (Brunton, 1997). Benefit sharing within the mine landowner communities has brought challenges that contribute to the local populations becoming very dependent on the mine for revenue. The lack of gardening land reported at Porgera means subsistence food production is no longer viable for many (Johnson, 2011).

Health facilities including aid posts, rural health centres and district hospitals are often also confronted with a lack of financial resources to deliver effective and efficient health services even whilst the mine is operating. Hence, the lack of financial resources is also evident in affecting the level of service from these facilities, a factor which has proven to have negative impacts on other health service resources, such as drug supplies, and food for inpatients (Howes et al, 2014). The Bilum in relation to wokim moni is sold for income generation, used as storage of cash and other valuables.

#### **4.5.4 Pasin Tubuna (Cultural Capital)**

Pasin Tubuna includes the beliefs, heritage, and rituals of local indigenous populations, including their traditional health practices (Sseguya et al., 2009). It is distinct from social capital as it reflects the ways of living that connect people to their environment through beliefs and religion. Communities affected by mining in PNG are diverse and unique groups of people with distinct cultures based around their own sets of values and rituals that they deploy to deal with, for example, changes in the natural environment,



and illness. PNG has over 830 different languages, and a vast range of totemic symbols, myths and cultural practices. One example is in terms of traditional cultural practices around health. In one relevant case, among people on Lihir, the traditional health practices including trepanation<sup>12</sup> seem to be resilient (Macintyre et al., 2005) and operate in parallel to biomedical treatments.

Typically when a family member falls sick, it is dealt with initially in two different ways; either prayer and/ or the use of traditional healing approaches such as using specific herbs or medicinal plants; or second take the sick person to the hospital, and seek treatment through biomedicine. A third approach is an integration of these two, fusing cultural practices such as prayer and traditional medicines with the modern treatment (Kipalan, et al., 2012; Koka, et al., 2014). Traditional practices in general are formed through the communities' histories and the development of their distinctive identities (Macfarlane & Alpers, 2009). Changes have also been brought by Christianity and Christian beliefs within these communities, so there is now a great diversity in the way communities culturally relate to their environment and the way they deal with health issues. It is important therefore to examine how each community uses their culturally-informed approaches to their respective health issues and through this understand and appreciate the importance of Pasin Tubuna to shaping approaches to community resilience. Pasin Tubuna is part of the Bilum as this bag signifies the identity of various tribes and clans. The Bilum is used in different culturally significant ways including the

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<sup>12</sup> The concept is strictly a "circular opening made in the skull by an instrument called a trephine which was invented for surgical use in Europe in 1628" (Macintyre, et al., 2005, p.89). The use of the term here refers to a Melanesian practice that did not require the use of a surgical tool.

storage and carrying of herbs and other healing ornaments (Mackenzie, 1991). Pasin Tubuna, like the loops of the Bilum integrates with each other.

#### 4.5.5 Bung Wantaim (Social Capital)

Bung Wantaim refers to interpersonal networks between and among different groups of individuals. Such networks can enable people to confidently interact with other individuals and institutions, and hence access resources, knowledge and skills that can benefit themselves and the impacted communities (Hassan & Birungi, 2011). It is distinguished from other community capitals through its emphasis on the development and facilitation of positive interactions such as more community oriented approaches and networks to achieve collective action (Ansari, Munir & Gregg, 2012; Nelson & Finan, 2009; Magis, 2007). Bung Wantaim also has the potential to reduce poverty and become a major contributing factor to resilience for a local population by building relationships that could contribute to people accessing opportunities such as education and employment (Hassan & Birungi, 2011). Positive community engagement in different activities can develop skills so that community members can be more proactive in their community, and this in turn can lead them to developing confidence and self-esteem. In this sense, the link to capacity-building for local empowerment is an important part of this, as noted earlier in the chapter.

Kinship networks in PNG represent a very strong form of social capital, structuring many aspects of the Melanesian life world, and linking central concepts of identity, reciprocity and exchange (Bainton, 2008; Sahlins, 2011). Much of the literature on mining in PNG has shown social capital to be vulnerable to disturbance and disintegration as a result of the impacts of mining (see Filer, 1990). For example, in the context of large-scale mining, landowners often find that their extended family expects

some sort of payments for the assistance they give, working against traditional norms. This leads to the breaking down of strong family ties that used to exist prior to mining and has negative impacts on community resilience.

Mining communities confronted with multiple social pathologies (alcoholism, violence, prostitution, breakdown of leadership etc.) can benefit enormously from strong social capital but are typically negatively affected in terms of diminished social capital. Research elsewhere suggests that positive developmental outcomes and resilience can only be achieved if social capital is built and integrated with the other related community capitals (Nelsen et al., 2010). A study done on health determinants in Canada similarly showed that health problems were indicators of other social factors such as the strength of the family social network (Bronson & Noble, 2006).

In PNG, the lack of collaborative participation in the planning process for social services delivery from the relevant stakeholders (including the government, the church, the mining companies, and MICs) has marginalised existing local forms of social capital and that contributed too many negative effects. While the GoPNG plays a central role in the regulation of mining companies accessing minerals, as well as deciding on the sharing of mining benefit (Banks, 2008; Filer & Imbun, 2004; James, 1997), it is preoccupied with these revenue generating policies and this results in it overlooking the roles that the mining companies and landowner representatives could have in the provision of services that are sustainable for and by communities at all stages of mining (Banks, 2003; Jorgensen, 2006). This consequently has led to other challenges such as disputes over landowner equity, migration, gender and health issues and even civil war in the case of

Bougainville Copper Limited (Hilson, 2006). In fact, there are more negative impacts generated by benefit distribution such as social problems involving youth and disputes including domestic violence, that reflect the undermining of social capital (Johnson, 2011).

The extent of homogeneity of local residents in a community is regarded as significant in maintaining internal stability. Hence it has been argued that “the social homogeneity among residential populations is another aspect of social capital, and is greater than the heterogeneity among mobile populations” (Haslam-Mckenzie, 2009, p.11). However, the homogeneity of the local population can be significantly reduced by mobile populations such as the fly in-fly out work shifts of mining operations or other forms of in-migration typically found at mines (Petkova–Timmer, Lockie, Rolfe & Ivanova, 2009). In PNG for example, in-migration from both within the district and from other parts of PNG has contributed massively to the population increase in communities around mining operations. This has caused overcrowding leading to other associated challenges like land and food shortages, marriage break ups, domestic violence, higher rates of polygamy, and prostitution (Hammar, 2008; Kinlaw, 2008; Johnson, 2011). The homogeneity of the mine-impacted communities is threatened by the influx of people from outside especially from other parts of PNG. It puts pressure on the family, and kinship relations of the local family ties. Migration also puts pressure on the limited resources available to deliver services, including health. This poses a challenge to the possibility of social capital contributing towards the building of resilience in these communities. These compounding effects of migration reduce the social homogeneity of the mining communities, which in turn lowers bung wantaim. This can contribute to a

reduction in resilience within these mining-impacted communities. However, some issues like marriage break ups which were often seen as bad can be a means for women to gain power to change their life circumstances, especially for those walking out of polygamous or violent relationships (Buchanan, et al., 2011, pp.30-35). Bung wantaim from the perspective of the Bilum encourages the building of relationships among those who knit these bags. Women gather in groups and weave their Bilums, and this contributes to the formation of social relationships.

#### **4.5.6 Kibung (Political Capital)**

Kibung is concerned with the ability of affected communities to participate in the decision making process, and “to access resources, power, and power brokers, as well as to impact the rules and regulations that affect it (them)” (Magis, 2007, p15). It applies to these communities’ access to decision making power both within and outside the community. This also covers the input into relevant policies such as PNG’s Vision 2050 (The Ministry of National Planning, 2010), the National Health Plan (NHP) (NDoH, 2010) and the Mining Act (49. 2000). More recent attention (McKay & Lepani, 2010; Thomason & Hancock, 2011; Hermer, 2005) on health infrastructure and service delivery shows that difficulties in impacted communities accessing relevant health services in all stages of mining is partly a consequence of structural weaknesses at the national level. These structural weaknesses imply the lack of alignment in the relevant policies that would allow communities to build resilience in order to sustain effective and efficient delivery of services from the both, during and after mine closure.

Recent evidence suggests that there is lack of collaboration from the relevant stakeholders (McKay & Lepani, 2010; Thomason & Hancock, 2011) in making decisions that affect the effective and efficient delivery of health services in PNG. Stakeholders make decisions without liaising with each other, causing problems in areas such as the employment and movement of skilled staff. Decisions are usually made without consulting the majority of the community members such as the youth or the women. Therefore, the lack of equal participation in decision making (Banks, 2003) negatively impacts on the building of CR. In a study on the Ravensthorpe nickel mine in Western Australia, BHP Billiton's failure to consult or notify the community of mine closure left most community members in a state of shock with no employment and sources of income (Pini, Mayes & McDonald, 2010) and this detracted from the building of resilience in this community.

In PNG, in theory no individual can claim to make representative negotiations in isolation from other clan members unless a consensus had been reached by all clan members. Johnson (2012) confirms in his study that many decisions made for incorporation into the MoAs on service delivery structurally exclude the bulk of the local populations (Filer, 2008). Even the majority of the landowners whose land was taken did not have a say in how they might benefit from these services. Studies elsewhere (Muthuri, et al., 2009) highlighted the benefits of institutionalising participation in decision-making. In this instance, a developmental-relational approach to community development encouraged effective participation of community members engaging in local business. As the individual looped knots in the structure of the Bilum all parties must collaborate with each other to achieve sustainability of proactive

participation among community members. Like the gatherings of twins that hold the Bilum as one, stakeholders must act as a team through kibung to achieve resilience.

#### **4.5.7 Wokim Samting (Built Capital)**

Wokim Samting refers to community infrastructure including the facilities that enable the delivery of relevant health services in these communities affected by mining (Emery & Flora, 2006; Flora & Thiboumery, 2005). It includes infrastructure such as the transport system, roads, buildings, bridges, electronic communications and hospital equipment. In the Papua New Guinea context wokim samting is often the main focus in the agreements that flow from the Development Forums as this is a priority for many of these communities (see appendices 8 & 9). Local stakeholders negotiate to ensure that infrastructure in the form of roads and buildings are included as part of the benefit packages. The impact of MoAs on the infrastructure available to mining communities in PNG is acknowledged by many authors (Banks, 2003; Filer, 1990, 2004; Halvaksz, 2008; Imbun, 2013).

The effective and efficient functioning of wokim samting is significant to the building of infrastructure that can continue to support basic services such as health in these mining communities. The lack of it can have adverse effects on a community's resilience especially in the post-mine closure stage. This, as illustrated by various studies (Littlewood, 2014; Morrison, Wilson, & Bell, 2012; Veiga, et al., 2001), is a common experience of communities after mine closure. There is however, a lack of negotiation among all relevant stakeholders included in the respective MoAs in



relation to maintenance of provided infrastructure after mine closure. Communities that host multinational mining operations are usually left with challenges in accessing services that were easily available during the operational stage in mining. In the communities in PNG there are no specific guidelines made by the GoPNG on how mining companies should deal with enabling infrastructure and service delivery mechanisms in the post-mining phase (Banks, 1993; Kepore & Imbun, 2011). Like the Bilum where the owner takes charge of the broken gatherings, the GoPNG must take responsibility over Wokim Samting to sustain available services after mine closure.

#### **4.5.8 Integration of capitals**

All these community capitals overlap in shaping the capacity and resilience of the community, and the extent of the available health services in the mine-impacted communities. Several factors, including roads and transport, lack of finances, power supply and lack of medical personnel, are discussed here to highlight the way in which interactions between the community capitals in the delivery of health services can either contribute to or detract from the building of resilience in these communities.

First, roads and transport can contribute significantly to the delivery of health services, as they allow greater access for surrounding populations to the health facilities. Roads must be well maintained for vehicles to travel. Each complements the other. In other words, if there are no roads or vehicles, patients will encounter difficulties in accessing the availability of health services (Muller, et al., 1998; Noor, et al., 2006).

Secondly, the supply of electricity and a lack of medical experts impact on other factors in the delivery of health services. In Misima, after mine closure the supply of power became a challenge as it was inconsistent (Byford, n.d.). Power failure was a continuous problem which consequently led to the destruction of equipment such as the communication systems that relied on power. Effective communication in dealing with emergencies such as critically ill sick patients became impossible. Patients who required immediate help were not attended to and this led to preventable deaths. Other studies also discuss the compounding effects of the integration of social capital with other capitals in enabling effective and efficient delivery of services when the disadvantaged households can interact with others who can assist them in accessing these services (Hassan & Birungi, 2011; Lockie, Franettovich, Petkova-Timmer, Rolfe & Ivanova, 2009; Sherrieb, Norris & Galea, 2010). The interaction of community capitals is directly linked to the Bilum where the different strands overlap each other. These strands operate in an integrating fashion where one gains strength from the other and build resilience to achieve sustainable communities. The following section discusses a general view on sustainability and mining in Melanesia.

#### **4.6 Sustainability and mining in Melanesia**

Sustainable development and mining in Melanesian communities has been the subject of extensive discourse among academics, consultants, civil society and others. Much of this discussion has been around the evolution on the original definition of the concept of sustainability by the mining industry. This subsection discusses two main points: first, sustainability and mining in Melanesia in relation to the application of the

concept's original definition by WCED (1987) and the definition's progressive adoption by the mining industry. The second point will be around discussions on the utilisation of natural capital to develop other capitals. Although there is some mining in other Melanesian countries including the French Territory of New Caledonia, Fiji and the Solomon Islands their experiences are not as significant (with the exception of the very different political context in New Caledonia) in contributing economically to their countries' revenue as PNG's (Filer & Macintyre, 2006). As such, examples from PNG will be used to illustrate the practical application of sustainability to mining in Melanesia.

The original definition of sustainability came from the 1987 Brundtland report: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987 as cited by Gilberthorpe, 2013, p.469). This definition focused on the protection of the natural environment, ensuring that resources are not over-used and emphasise strongly the importance of these resources for future generations' benefit. This relates to this thesis in terms of the importance of protection and development of natural capital in the Melanesian context. Melanesians are neither explicit environmentalists nor conservationists; they care about their environment but do not actively pursue conservation strategies (Kirsch (2008, p. 290). Some authors with lack of understanding of indigenous people "draw on dualist models of Nature vs. Culture. They place industrial man in the cultural domain and local Papua New Guineans firmly in the natural world, along with plants and animals"(Macintyre & Foale, 2004, p. 233). And while Melanesians are embedded into their environment, they are connected to their environment for their livelihood

and resources. They garden, fish and hunt and even turn to it for medicinal plants for health purposes. To these communities their environment is their economic, social and cultural sustenance (Banks, 2002). This is important to the development of natural capital which can contribute to the building of resilience in the mining communities.

On the other hand, the original meaning on the concept of sustainability has been reworked by the mining industry. Sustainability has undergone progressive redefinition, consequently reducing its original meaning (Gilberthorpe, 2013). Placer Dome a Canadian mining company was one of the first to integrate sustainability into its corporate responsibilities (Kirsch, 2010) focusing on the notion of 'leaving behind a better future' (MML, 2002) for a more sustainable form of mining in the Asia Pacific region. Placer Dome used their own sustainability framework, a corporate model developed internationally, to plan for post mine closure activities in Misima (Jackson, 2002). The mining industry primarily relates sustainable development to economic variables (Kirsch, 2010). As Kirsch further puts it "sustainable development is presented in terms of royalties and taxes that can be used to support development as business opportunities projected to continue after mine closure" (2010, p.90). The redefined definition of sustainability has been applied by many mining companies (Gilberthorpe, 2013, p. 469) centring their sustainable mining activities in the form of corporate community development projects (Banks et al., 2013) which aim to extend benefits of mining beyond mine closure. This version of sustainability is the meaning that is often used to explain sustainable development and mining communities in PNG.

#### **4.6.1 Utilisation of natural capital to develop other capitals**

Sustainability and mining in this context adapts a perspective that examines how natural capital can be transformed to develop other capitals including financial, built and human capital. Natural capital in the form of minerals such as gold and copper generate revenue for the state and the impacted communities (Kirsch, 210) which in turn is used to build other community capitals. More often sustainability is focused on financial investments to develop long-term community development projects through the use of instruments such as future generations' funds. A certain percentage of the revenue streams and especially royalties to the community (including the landowners) are diverted into instruments used for sustainable projects which while similar across the operations, vary according to the plans of each mining community.

Financial capital received from the minerals is often invested to generate income mainly for the landowning communities. The Mineral Resource Development Authority is the mandated body that assist landowner groups in investments. These investments are used in different ways for community development projects, such as developing built capital in the case of Ok Tedi. Ok Tedi landowners are now investing in the Hilson Group of Companies by building hotels. This initiative is a public private partnership between Australia and New Zealand Bank, Petroleum Resource Kutubu (PRK), Mineral Resource Star Mountain and Mineral Resource OK Tedi No.2 and the State (Callan, 2012). The PNG Sustainable Development Project also focuses on sustainable community development projects in Ok Tedi mining impacted communities and other projects around the country (Callan, 2012). Built capital in the form of hotels will

generate future income for the landowners and contribute to the building of resilience in the mining communities in Ok Tedi.

Education forms a critical component for developing human capital. Financial capital is important here in terms of providing the resources now and in the future for quality education to be accessible. Regarding education, most mining companies assist the government with establishing or renovating schools to educate the younger generation (Gilberthorpe & Banks, 2012, p. 191). The future generations' funds are typically reserved for children for later use in their education. After a comprehensive literature review it has become apparent that there is lack of literature on future generations' funds. These funds are used for scholarships to sponsor a younger generation to colleges and tertiary institutions in PNG and abroad. The MoA of each mine determines the ways these funds are to be used. For example in the case of Lihir the scholarship covers all indigenous Lihirian children including those with one parent who is a Lihirian (Field notes, 2012). In Porgera and Ok Tedi scholarships are also offered for students to undertake studies both within and abroad. In the case of Misima many have stated that an important legacy of mining is an educated indigenous population developed by the mining company (MML). The future generations' funds in Misima also sponsored students to be educated outside of Misima (Field notes, 2012). However, there is lack of information on how these funds will be sustained after mine closure. This building of human capital is a significant contribution from mining revenue towards more resilient communities and sustainable development.

#### **4.7 Limitations of the Bilum Framework**

The Bilum Framework, as proposed here, does have limitations that should be acknowledged. It can be argued that the community capitals framework is too difficult to handle as a basis upon which to plan and implement. The approach is broad and covers many aspects that can be a challenge to plan for and then implement. There is also an element of subjectivity and separation with any assessment of each of the capitals, in large part due to the argument made that the capitals are closely integrated, and indeed not always discrete. A capitals-based planning process requires the many stakeholders to come up with an integrated master plan to deliver health services, for example. This, though, can be difficult to achieve, especially where governance mechanism that promote collaboration and partnership are weak. Studies of health services indicated the application of social capital to health policy can be difficult and problematic, with some community members finding access to decision-making processes and resulting services difficult due to social factors such as poverty or age (Shortt, 2004; Veenstra, 2002).

The purpose of the Bilum Framework is to be a basic model that can be applied in the mine affected communities to evaluate and build resilience to sustain effective and efficient health and other services in all stages of mining. Resembling the multiple uses of a Bilum, the interactions of the community capitals build resilience. It is also notable that the reverse also applies to resilience — i.e. that more resilient communities find that ensuring the sustainability of these health services is easier. This interaction parallels the different uses of a Bilum and the interactions of the community capitals function to support a range of processes and activities that build community

resilience. All the capitals are interlinked, and operate as a Bilum where every single thread is important. If one of the threads rots or is cut, it will weaken the Bilum, which then will continue to break apart and eventually be completely destroyed. Likewise, the weakening or absence of one capital has a negative impact on the others and weakens resilience. To achieve resilient communities all community capitals must operate together to strengthen the basis on which the community functions, reflecting the underlying rationale of the Bilum Framework.

## **4.8 Conclusion**

Community resilience is ideally the building of strength from negative experiences to achieve healthy and sustainable communities, along with the sustainability of services in a community at all stages of mining including the beginning, the operational stage and beyond mine closure. Community resilience typically evolves through four stages of adaptation, collaboration and planning, mobilisation and implementation, and measuring and monitoring of the level of resilience in the concerned communities.

The operational definition for this thesis is inclined towards constructivist thinking, and relates the building of resilience to the concept of community capitals that are applied in this thesis to the delivery of health services in the mine affected communities. The process of building resilience requires cooperative planning amongst all stakeholders to influence the future of the concerned communities in a positive manner. Literature suggests that stakeholders need to participate over the long term and across all stages of



mining to build the capacity and resilience of the communities, a significant element of which is the sustainability of services in the long run.

The Bilum Framework analyses the effects of change (mining, for example) in terms of their contribution to, or weakening of, community resilience in a holistic manner. It supports community development that pays equal attention to all aspects of development (McIntosh, et al., 2008). The concept of the Bilum Framework reiterates the function of community capitals as being multi-dimensional in their contribution to building resilience (Flora & Thibourmery, 2005) in part through achieving sustainable delivery of health services. The main focus of the Bilum Framework is on the cooperation and contributions of four relevant stakeholders: the GoPNG, the Church, the Mining Company, and the impacted communities. The collaborations between these stakeholders are potentially substantial in reinforcing community capitals and assisting in building community resilience (Berkes & Ross, 2013). The Bilum Framework provides a structure for the argument of this thesis that seeks to create understanding of the issues associated with the building of community resilience and the challenges of meeting them.

It is also proposed that this community capitals framework could be used to measure the building of CR through its proxy indicators. Consequently, the Bilum Framework is also formulated in such a way to promote the sustainability of effective and efficient health services. The next Chapter presents the design of the study for this thesis, building specifically on the Bilum Framework developed here.

# Chapter 5

## Research Design and Methodology

### 5.1 Introduction

“Research is the process of developing new knowledge by gathering data that answers a particular question” (O’Leary, 2010, p. 12). Traditionally, born out of positivism, the world was thought to be knowable and predictable, hence research was empirical and reductionist, the researcher was objective, methods were hypothesis-driven and findings were quantitative<sup>13</sup>, statistically testable and generalizable. This way of knowing about the world and doing research has since been brought into question (O’Leary, 2010, p. 12). This is particularly case for those investigating the human experience and seeking to understand the richness of the social world (Elliott, et al., 1999, p. 216; Krefting, 1991; O’Day & Killen, 2002; Mason, 2002; Ormston, Spencer, Barnard & Snape, 2013; also see Stewart-Withers, Banks, McGregor & Meo-Sewabu, 2014, p. 59). This later approach enables researchers to better understand the particular context of their study — be it homes or communities, and how these influence the various community capitals that communities may have access to. The importance of gaining in depth understanding of people within their holistic natural contexts by applying qualitative<sup>14</sup> research approaches is further confirmed by

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<sup>13</sup> Quantitative research methods require the use of a standardized approach so that people’s experiences can be categorised consistently (Sandelowski, 2000).

<sup>14</sup> Qualitative research methods aim to “understand and represent the experiences and actions of people as they encounter, engage, and live through situations” (Elliott, et al., 1999, p. 216).

Camfield, Crivello and Woodhead (2009). Qualitative and quantitative approaches to research should not however, be seen as mutually exclusive, rather there is a space whereby the value and insights offered by both approaches can be appreciated, as in the case of this research where a mixed method methodology is privileged. With this in mind, the overall intention of this chapter is to outline the research design, which brings together both quantitative and qualitative approaches to data collection and analysis, and the fieldwork experiences. To reiterate, the aim of this study is to investigate the delivery of health services and the relationship this has with the building of community resilience among populations affected by large-scale mining in PNG. This investigation is structured around four main research objectives (also see chapter 1), which are:

- (i) To identify the relationship between community resilience, community capitals, and health service delivery in these mine-affected communities;*
- (ii) To discover the constraints or contributions that surround the delivery of health services (and hence the building of resilience) in these communities;*
- (iii) To explore the ways in which levels of resilience can be assessed; and,*
- (iv) To develop a Melanesian-centric 'Bilum Framework' and show how this can provide for a greater understanding of the challenges on building community resilience through the delivery of health services.*

The chapter is presented in nine main sections. After this introduction, section 5.2 outlines the epistemological underpinnings that explain the theory of knowledge in this research, while section 5.3 justifies the use of the case study approach. Section 5.4 explains the importance of triangulation or mixed method research methodology for a study. Sections 5.5 and 5.6 discusses the quantitative and qualitative research methods employed in this study. Section 5.7 develops an original method for measuring community capitals and the levels of resilience while, section 5.8 outlines

the ethical procedures for this study. Limitations encountered in the study are presented in section 5.9 and section 5.10 is the conclusion.

## **5.2 Epistemological underpinnings of this research**

Epistemology is an explanation of the theory of knowledge that underpins an understanding of reality in any specific research project. Epistemology is thus about the nature of knowledge, ways of getting to know, knowing, justifying knowledge claims, and/or the relationship between the knowledge seeker and the knowledge they construct. Hence it concerns the manner in which knowledge is acquired, processed, and applied in a particular social context (Chan & Elliot, 2004; Elliot, et al., 1999; Wahyuni, 2012). Overall this study adopts an in-depth, constructivist case study approach to investigate the research questions, and at different points, both the constructivist and positivist approaches are applied. Constructivism and interpretivism emphasise that knowledge is subjective and meaning is created by people or subjects in a particular context (Perry, 1998). The residents in the study environment with real life experiences determine the data a researcher collects: their perceptions, behaviours and understandings of particular aspects of the world are thus of interest (Dooley, 2002, p. 336). Conversely, positivism argues that the 'reality' of the issue under investigation can be (dis)proven by testing, measurement and statistical analysis. The positivist approach is more associated with 'procedures such as "inferential statistics, hypothesis testing, mathematical analysis, and experimental and quasi-experimental design"' (Lee, 1991, p.342). This approach, which argues that there is external reality in any context that can be encountered, measured and described

independent of people's perception of it, is then more based on linking predetermined tests to the real world.

As mentioned this study engages with both constructivism and positivism. The constructivist approach lends itself to application of qualitative research methods such as interviews for collecting information on the real life experiences of informants, while the positivist tactic is evident in the survey questionnaire where the data generated are used to measure the levels of resilience. Qualitative data collection techniques were hence applied to gather real life experiences, while the quantitative approach was utilised to gain a broader picture of community perceptions and attitudes towards the strength of various community capitals, health service delivery and resilience across the three case study sites. These mixed methods fit with the case study approach to research whereby questions can be answered "by using either qualitative or quantitative evidence" (Yin, 1981, p.58).

### **5.3 Case study approach**

For the purpose of answering the above-mentioned research questions and achieving the research objectives a case study approach was selected as the most appropriate research strategy. Indeed the research strategy should be determined by the aim and the type of questions asked (Yin, 2003). Moreover, as described by Yin (2003) a case study is:

*An empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003, p.13)*

Yin goes onto argue that in undertaking case study research a comprehensive research strategy is needed, one that relies on multiple case studies and multiple data sources, where corroboration or triangulation can occur. Case studies can include different types of data, hence quantitative, qualitative and historical data can be used to describe, analyse and evaluate interactions within a particular context (Yin, 2003, p.13). In this instance the case study method is chosen as a research approach because it can give an intensive description and analysis of a particular situation or environment (Merriam, 2002), *in this case, of the mine impacted communities in PNG.*

### **5.3.1 Selecting the case studies**

This study employed a multiple case study approach. Yin (2003, 2012) defines a multiple case design as one that contains more than a single case, and such designs allow a researcher to explore a particular issue in greater comparative depth. As such, this fieldwork draws on case studies from three selected mine-impacted communities in PNG. The three case studies for this investigation were drawn from the communities around the Misima, Lihir and Hidden Valley mines. The central issue to be investigated across the three sites is the way in which different community capitals (as illustrated by the Bilum Framework) are strengthened or weakened by the delivery of health services, which in turn helps understand the effects of the mine development on community resilience.

The selected case study communities were preferred over others because of their specific experiences of mining in two main ways. The concept of 'building community resilience implies an analysis of the time factor in the development of resilience — i.e. the past, present, and future of mine-impacted communities. The strengthening of community resilience requires also an understanding of the development path of the community and the shifts in the relative strength of the different elements of the Bilum Framework in line with the mine life timeframe. It is only by being based on these experiences that future planning can proceed.

The three selected communities are experiencing different stages of a mine operation. Misima experienced mine closure in 2004 after almost 15 years of operation; Lihir has now operated for almost two decades, while at Hidden Valley construction started in 2008, and the mine only went into full production in 2010. The different experiences of the selected case studies makes them suitable for the generation of data to be able to understand the processes around resilience that occur over the life of a large-scale mine. Figure 5.1 shows the location of the case study sites used for this study.



Figure: 5.1 Case study sites.

Source: [Geology.com/world/papua-new-guinea-satellite-image.shtml](http://Geology.com/world/papua-new-guinea-satellite-image.shtml).

### 5.3.2 Participants in the case studies

The research participants (see Table 5.1) for this study from the three communities fell into four main categories of stakeholders: Government and private health workers, landowners, other community members, and mining company employees. Table 5.1 presents the distribution of research participants in each of the case study sites.

Mining company input on their contributions to health services were not obtained at two of the sites as interviewees were not available in Hidden Valley, and Misima is now closed. In Hidden Valley the relevant company authorities delayed permission to allow me to carry out research, and I ran out of time so could not interview any mine



officials. In Misima the mine has been closed for over a decade, and there was no mining official around to be interviewed<sup>15</sup>. As a result, Lihir was the only mine where all four categories of participants were interviewed.

**Table 5.1: Research participants.**

Stakeholders	Site	Applied research methods				Family survey	Total interviewees
		Semi-structured questions	structured observations	Facilities	Meetings-Conference		
		Focus groups <i>(including landowners)</i>	Key participants				
Govt agencies	Port Moresby						
NDoH			4		1		4
MRA			5				5
DMPGM			1				1
Others			2				2
1. Nat. planning							
2. Prov. Affairs							
							<b>12</b>
Mining Companies							
	Misima		Closed				0
	Lihir		13				13
	Hidden Valley		Delay in granting access				0
							<b>13</b>
Mine Impacted Communities							
	Misima	5	8	2	1	20	35
	Lihir	4	7	2		22	36
	Hidden Valley	2	6	2	2	20	38
							<b>109</b>
						<b>TOTAL</b>	<b>144</b>

Source: Fieldwork, (2012).

Table 5.1 presents the research participants for this study. Each of these categories of stakeholder provided different material and perspectives for the research. Firstly, participants from the government provided knowledge and information on policy

<sup>15</sup> The mining company, Placer Pacific, part of Placer Dome, no longer exists, having been taken over by Barrick.

aspects of the delivery of health services to the communities. The officers who contributed significant information in this study were government employees in Port Moresby who were involved in policy making positions and located mainly in the NDoH, MRA, and DMPGM. Information from these officers was significant in illuminating the extent of the collaboration between the government and the mining companies in the delivery of health services in the MICs. Their knowledge on the available policies confirmed my findings and deepened my understanding in undertaking the document analysis on the delivery of health services in the different communities. Apart from that, their knowledge also enabled me to understand how the different government agencies work in partnership with other stakeholders. Secondly, company officials from Newcrest Ltd on Lihir contributed their views and knowledge of the plans and programmes they had that contributed to local health service delivery. The third category was the community members who lived within the case-study communities, including the landowners. The landowners' views were collected mainly from the focus group discussions. These participants were central to the research because of their experience, views and knowledge of the available health services in their communities.

### **5.3.3 Limitations of the case study approach**

The case study approach to research has various weaknesses however, such as unmanageable and complex empirical data and the inability to generalise from the results to a broader population (Miles, 1979). These three issues will now be discussed.

Recent work by Yin (2011) confirms that the case study approach to research can create complications in data management. Some authors (Malterud, 2001, p.484; Miles, 1979) were of the view that information collected from qualitative research methods such as interviews could be difficult to analyse and validate the reliability of the results. The validity of a case study can be questioned due to the “grounds that the case study outcomes are known to the researcher at the time of when the hypotheses are formulated” (Bitekhitine, 2005, p.2). To reduce the chances of these weaknesses, a thematic approach was employed to analyse the data collected from the semi-structured interviews. In that way I was able to maintain systematic control of the information as I carried out the analysis of my material. Thematic synthesis of primary empirical data enables researchers to maintain a relationship between the results of the study and the conclusions drawn from these data (Thomas & Harden, 2008).

There is a danger however that there can be too much empirical data from case studies so researchers struggle to develop complex theories (see Eisenhardt, 1989). Too much information on a single case study could be a temptation for researchers attempting to capture everything in the case study. To lessen the chances of this weakness, I reviewed and compared other studies within the literature and research questions relating to the building of community resilience and community capitals prior to the formulation of the Bilum Framework to try and maintain a more focussed approach.

Finally, the problem of generalising from case studies is met to some extent at least by the use of three case studies. This meant the research covered approximately a third

of Papua New Guinea's mining operations. In turn this means the dangers of generalising regarding the effects of mining on community resilience from the case studies are significantly reduced.

## 5.4 Mixed method research methodology

The triangulation or mixed method research methodology is the use of a combination of several methods to pursue results for a study. Methodological triangulation is an important part of mixed-method research (Fielding, 2012) and occurs in two ways: across-method and within-method (Begley, 1996; Bekhet & Zauszniewski, 2012). Across-method concerns the use of research methods from both qualitative and quantitative approaches (Bekhet & Zauszniewski, 2012; Flint, Gammelgaard, Golicic & Davis, 2012), while within-method refers to methods from only a qualitative or quantitative lens in a single research project. Silverman (1985) as cited in (Begley, 1996) argues that triangulation can occur in five different areas of the project: data, investigator, theoretical, methodological, and analysis. Two of these approaches, namely data and methodological triangulation, are used in this research. Data triangulation in my work refers to the collection of data from the three different mine sites on the same issue as it "involves the collection of data from multiple sites" (Begley, 1996, p.123). The data from Misima, Lihir and Hidden Valley were collected and analysed separately. Triangulation in mixed-method research is important as it contributes to the analysis and validity of the *data* (Fielding, 2012). As stated above this allows for more robust statements to be made about the impact of mining on community resilience than if just one site had been visited. A recent study on

methodological triangulation by Bekhet and Zauszniewski (2012) illustrates the significance of the combination of these methods complementing findings. More recent literature on data triangulation also supports the importance of analysing data from several methods within qualitative or quantitative methods (Fielding, 2012; Guest, 2013).

The within-method, in this case, was applied in the qualitative approach where document analysis, semi-structured interviews and structured observations were engaged with no particular focus on quantity. Across-method triangulation was applied in the survey questionnaire administered to community members at the three sites. The questionnaire included both sections with open-ended questions, and some requiring specifically pre-set answers that were then quantified. The qualitative research approaches in this study are relevant to the collection of data on how people feel about the availability of health services in their mining sites, while the quantitative approach aims to confirm findings from the former research methods.

The use of mixed-methods enabled me to collect a range of data that were relevant to the delivery of health services and the effects on the community capitals, which contribute to the strengthening of resilience among the mine-impacted communities in PNG. This mixing of methods was very important to the measuring of resilience in these case study communities as the more quantitative material were used to provide numeric figures of the strength of community resilience at different sites and points in time, and these were able to be more fully explored and understood through the data collected by the qualitative research approaches.

## 5.5 Qualitative research methods

The application of qualitative research methods allowed for the collection of information on the life experiences of people who are impacted by mining operations in PNG. As noted above, the fieldwork was done in three field sites (Misima, Lihir and Hidden Valley), as well as Port Moresby, the capital city. Port Moresby was significant as it is the location of the headquarters for all the government departments, from which policy and funding is disseminated, and reports from Districts and mine sites received. The qualitative research methods applied in this study were document analysis, semi-structured interviews, focus groups and purposive observation. These will now be described in the following sections emphasising the contribution that each made to this research.

### 5.5.1 Document analysis

Document analysis is defined as a “systematic procedure for reviewing or evaluating documents- both printed and electronic (*computer-based and Internet-transmitted*) material “(Bowen, 2009, p.27). This method allows one to explore available documents or literature, reviewing and interpreting the chosen documents (Bowen, 2009). In this case, documents relating to the delivery of health services and the effects of mining on the resilience of affected communities are reviewed. The document analysis in this study includes some academic literature, various government policies and reports,

company documents and grey literature such as unpublished research reports and newspaper articles. Document analysis occurred throughout this research: prior to fieldwork, during fieldwork and after fieldwork, depending on when the material became available or could be accessed. Document analysis assisted in the identification of research gaps, such as revealing the lack of finances to pay for health services and the lack of support services such as transport that formed the platform for this study prior to undertaking the fieldwork. After the research it added weight to the interpretations drawn from the data collected by other methods. The document material also assisted in ensuring that the discussions in this study are firmly grounded in previous work on decentralisation and health services by Standish (1983), Thomason and Karel (1994); as well as the work of others (Whittaker & Thomason, 2009; Johnson, 2011; Thomason & Hancock, 2011) on mining and health services as presented in chapters 2 and 3.

Documents from relevant government departments, including the NDoH, DMPHM, Department of National Planning and Monitoring (DNPM) and statutory bodies such as the PNG Chamber of Mining and Petroleum (PNGCMP) and MRA were reviewed. Documents were obtained from these organisations due to their involvement in the mining industry and in terms of policy surrounding the delivery of health services in the MICs. Mining company documents were mainly from Newcrest (Lihir), as Misima Mine is closed and Newcrest (Hidden Valley) delayed allowing me access to mining company documents. However, relevant literature on these two mines was accessed from other sources, including internet searches. There is a significant amount of academic work on Lihir (particularly Bainton and Macintyre), and various

anthropological studies of Misima and the Hidden valley area which provide useful context and background to this study, particularly in terms of traditional forms of health and healing, and the pre-existing strength of the social, cultural, economic and political capital in the different communities. There is “an existing wealth of experience understanding needs of stakeholders that could be assessed before additional interaction is warranted” (Dilling & Berggren, 2014, p.657).

Material from these documentary sources, when coupled with what was learnt through undertaking a literature review of scholarly publications, assisted in answering research questions 1 and 2, the first of these focussing on how current policy applications connect with and influence community capitals and resilience in the PNG context. Research question 2 aims to explore the constraints on the delivery of health services in the MICs and how these issues detract from the building of CR in the impacted communities. The literature and documents were approached and organised systematically, with relevant topics and themes identified and coded manually by hand. This approach to the literature allowed for more control of the content and for coding to pick up important themes as they emerged. However, document analysis does have limitations such as insufficient details in some documents that are not produced for the purpose of research (Bowen, 2009, p.31). This was certainly the case with much government or company documentation.

### **5.5.2 Semi-structured interviews**

Semi-structured interviews consist of pre-determined open-ended questions for the purpose of eliciting specific information from selected people on a particular subject.



These interviews are usually conducted as informal discussions or conversations with purpose (Pektovea et al., 2009; Pratt & Loizos, 1992). I employed semi-structured interviews to help me answer the first three research questions specifically.

The semi-structured interviews in this study were held with key informants and also formed the basis, in terms of the questions asked, for the focus groups discussions (see below). They provided information on the delivery of health services in the selected communities, including the factors that influence access to health services in these communities.

### **5.5.3 Purposive sampling and key informants**

Purposive sampling was carried out in the selected communities to identify individuals (or groups of people) with relevant information on the delivery of health services and how this can contribute to building community resilience. Initial key informants were thus purposely selected. Purposive sampling was selected over other sampling methods because of the geographical nature and location of the study, timing and financial constraints. The sample population are officials from the GoPNG departments - the NDoH, DNPM, DMPGM, Department of Provincial Affairs and Local Level Government Council (DPALLG), and the institutions involved in the mining sector — the Mineral Resource Authority (MRA) and mining companies in Misima, Lihir and Hidden Valley Mines. Key informants initially included individuals who were involved in policy, the delivery of services, and long-term community members from the selected mining communities in Misima, Lihir and Hidden Valley.

The key informants were people selected to give information in a particular research topic, and include those that are closely associated with the issue under investigation. These participants are chosen because they are “supposedly knowledgeable about the issues being researched and able and willing to communicate about them” (Kumar, Stern & Anderson, 1993, p.1634). In this study key informants are individuals who are actively involved in the planning, delivery, and use of health services in mining communities. Key informants from the national government departments (NDoH, DMPGM and MRA) are both from the policy and implementation sections. These officials are based mainly in Port Moresby. Interviewed officials from mining companies were all from Newcrest, on Lihir. Key personnel from the community affairs division and the International SOS (ISOS) Lihir Medical Centre on Lihir (LMC) were also interviewed. Officers from the community affairs were interviewed because they work directly with the communities. The ISOS staff members are medical workers who were at the frontline of delivering health services in these communities. Within the mining company, participants were identified based on their roles and responsibilities. A number of health officers who work in the mine -established health facilities were also interviewed. These participants were interviewed to get a mining company perspective on their policies and facilities, the delivery of health services in these communities as well as how they view the building of health services that can be sustained beyond mine closure.

Key informants from the communities comprised church leaders, women leaders, councillors, village court officials, local health workers, and youth leaders. Most of

these informants have lived in these communities for many years. These informants were significant because these are people who had experienced the ways in which the delivery and the use of health services occurred in these communities. With these key informants I had to be careful of “informant bias and random error” (Kumar, Stern & Anderson, 1993, p. 1634) which can give misleading information on the issue under examination associated with the use of key informants. To minimise this I initially chose informants who were actively involved in the delivery of and use of health services in the selected communities.

Having made initial connections, subsequent interviewees were identified through the snowball technique. Snowballing, as Browne (2005, p.47) explains, is the approach where the researcher in engaging with research participants looks also to the network of those interviewed in the belief that others will also have valuable information on the topic under investigation. Purposive snowballing as a means for participant recruitment was significant in the collecting of relevant data. Earlier participants were asked if they knew of others who were involved in the delivery of health services and who may be willing to be interviewed.

Semi-structured interviews allow for interaction between researcher and the research participants hence generating deeper information than say a structured interview would (Luna-Reyes & Andersen, 2003). The researcher/interviewer can also observe non-verbal messages such as body language and emotions from the participants. However, Yin argues that there is a danger that responses to interviews can be “what the interviewer wants to hear” (1994, p. 80). The interviewees may be answering

questions just to please the researcher, and not really be giving an account of the actual happenings regarding the issue that is being investigated. To minimise this weakness, in this study purposive observations (see below) were also carried out to ensure that information collected from the interviews matched the practices involved in the delivery of health services in the mine affected communities. However before this discussion occurs I will speak to the practice of focus groups as a data collection method.

#### **5.5.4 Focus groups**

A focus group is a group discussion with research participants in a particular setting on a common issue that affects them. Focus groups are a form of group interview that capitalises on communication between research participants in order to generate data (Kitzinger, 1995, p.299). It is a technique that involves in-depth group interviews with purposively selected participants (Rabiee, 2004). In this study focus group discussions were used only in the MICs. The use of focus groups was preferred for the following reasons: (i) it was more applicable in the MICs where there are more intact social groupings such as the women, church, and youth groups; (ii) it was more relevant in a smaller community where people were experiencing common problems caused by the mining operations, in one way or another; and, (iii) it was easier to gather people for a group discussion. It is worth mentioning that people in the communities had the time for group discussions unlike officials in the company or government offices.

It is important to note that I used a similar set of questions or discussion points applied in key informants to conduct focus groups' interviews. There were 6-8 participants in each group. The focus groups allow for more group-based exploration of issues in a general discussion rather than structured surveys (Rabie, 2004) and hence this technique can capture information that cannot be collected by the use of other research methods. However, focus group discussions can have disadvantages; most commonly, the views of outspoken participants can silence quieter or more passive participants. This method can also generate sensitivities when participants from different cultural groups are involved (Luna-Reyes & Andersen, 2003). Those who are loudest can dominate in discussions and decision making. To minimise this shortfall, I ensured that all participants had a chance to express their views on the delivery of health services in their respective communities.

### **5.5.5 Purposive observations**

Purposive or structured observation (Stewart-Withers, et al., 2014) is a data collection technique used to gather specific information targeted by the researcher within an identified context. It requires the researcher to carefully observe the actions of the subjects categorizing every piece of significant information (Chopra, Doherty, Jackson, & Ashworth, 2005; Martin, 1982; Stewart-Withers, et al., 2014). In this case, I employed purposive observation to collect targeted information in three different contexts: (i) in the health facilities such as aid posts and health district hospitals in the MICs; (ii) in meetings, and conferences, both within and outside of the concerned communities; and, (iii) general observations in the communities on the interactions

between the capitals elements of the Bilum Framework and their contribution to being able to access services that enabled people to receive health/medical treatment and care.

***Context 1: Observations in health facilities MICs***

I had three objectives for purposive observation in the mine-affected communities. The first one was to observe the means of transport people used to come to the health facilities. This directly related to elements of the community capitals such as financial and physical. The second one was to observe the interactions amongst different landowner groups in decision-making on the benefits of mining such as royalty and compensation distribution. The third objective was for general observations on the interaction of community capitals as support services contributing to the effective and efficient delivery of health facilities.

Firstly, I observed how the local populations accessed the health services. For example, I took note of the mode of transport they used and who they came with. Then I observed the health services with inpatient facilities, focussing on issues such as the provision of food for patients. In Misima, I carried out observations on the Eaos aid post, and Misima district hospital; in Lihir, Mahur Island sub-health centre and the LMC, an ISOS-run medical centre; and in Hidden Valley, I observed the Wau rural health centre and the Bulolo District Hospital. I employed observation research techniques to assist in assessing the extent to which the health services provided are relevant, effective, efficient, and sustainable and impact on the populations in the respective communities. Apart from that, I believe it is significant to have data on

general issues in the form of community capitals which impact on the delivery and receiving of appropriate health services. In this case, I was a non-participant observer as I could only observe, but not participate in the research environment (Martin, 1982). As noted, purposive observations are purposeful and include researchers determining in advance the specific activity they will observe (Stewart-Withers, et al., 2014, p. 64). The purpose of observations at the health centres in the selected MICs was to enable me as a researcher to gain both experience and gather more data that would assist me to interpret other information on the current health services made available in these communities, and this contributed to my understanding of some situations the participants encountered when in need of medical attention.

Secondly I observed three landowner meetings — i.e. one in Misima and two in Hidden Valley. I observed and recorded notes on issues such as royalties and compensation and decision-making in the community, and partnerships in the delivery of health services. The landowner meetings at both sites were concerned with the agreements signed in the Integrated Benefit Sharing Agreements (IBSA). In Misima, the landowner association discussed concerns that their MoA had never been implemented since the establishment of the mine. In Hidden Valley the discussions were centred on the review of the current MoAs to include some landowners who missed out on benefit sharing in the original MoAs.

### ***Context 2: General observations***

I made systematic general observations on a range of issues including the infrastructure for power and water supplies in the health facilities as they related to

the selected community capitals presented in the Bilum Framework in Chapter 4. I also made observations on issues such as the extent of migration into the community, social networking, decision making, and small-scale business activities in all selected MICs.

This method was applied in each selected community in at least two health facilities. I took field notes on the observations made in the overall service delivery including water and power supply, as well as the means of transporting people to the health facilities.

Purposive observation was used primarily to support work on the third research question which intends to explore whether a community capitals approach allows for greater understanding of the problems and challenges of building community resilience through improved access to health services in communities impacted by mining. However, purposive observations can be difficult for the collection of reliable data. It can be, for example, difficult to choose appropriate subjects to observe (Martin, 1982). This limitation was dealt with by retaining a focus on the different capitals and context of the Bilum Framework.

In sum, the qualitative research approaches used in this research are central, drawing on methods including document analysis, semi-structured interviews, focus groups, and purposive observations, to collect detailed information on the experiences of the community members in accessing the available health services in the selected communities. This approach also allowed me a deeper understanding of the physical



and political contexts which affect the people and the health services. The application of these qualitative research methods assisted, in a variety of ways including the experiences of interviewees in their communities, in the collection of data to develop and apply a Bilum Framework approach to building community resilience in communities impacted by mining in PNG. The next section, describes the quantitative research methods used in this research to complement these qualitative methods.

## **5.6 Quantitative research methods**

In quantitative research methods a standardized approach is required as this allows people's experiences to be categorised consistently (Sandelowski, 2000). Quantitative methods in the social sciences typically mean using a standardised questionnaire (Browne & Green, 2005) to collect data, and as a result the data collected is heavily determined by the structure of the research instrument itself. The advantage of such methods is that it is possible to obtain responses and data from many subjects to a limited set of questions. In this study a survey questionnaire was used to collect data to support findings from the qualitative research methods. The survey questionnaire was administered to families within the selected communities to obtain their perspectives on the delivery of health services. The quantitative material strengthens the data collected by other methods regarding the building of community resilience, and allows for the formulation of a methodology to assess the levels of resilience in the selected communities.

### 5.6.1 Survey questionnaire

The use of a survey questionnaire was intended to develop an additional understanding of the delivery of health services in the mine-impacted communities. It attempted to illuminate aspects of health service delivery including its availability, accessibility and affordability for the communities. According to the literature, a survey questionnaire is a quantitative method that has been widely used by other researchers to collect data on health issues (Stewart, Hay & Ware, 1988). Community members who had used the health services within their communities were selected for the survey. Initially the plan was to administer the survey to all adult members of a household, but this did not happen because typically one of the adult household members was not present at the time of the interview. Most individuals were approached for an interview in a health facility. The sample was mainly females who dominated (96 percent), particularly wives or mothers taking their children or other family members to the health care facilities for medical attention. For many families the wives or mothers were interviewed and they provided information on behalf of their husbands or partners. The majority of the informants agreed to participate in the survey. At least twenty families in each of the selected MICs participated in the survey (see Table 5.1).

The survey questionnaire was designed in such a way so as to collect information on the different community capitals in the affected communities. In this regard the survey questionnaire was designed to help answer research Question 3 which refers to

assessment of community resilience through community capitals. It was administered only to the people in the mining impacted communities (rather than other stakeholders) because it was intended to collect information from the perspective of users of health services in these communities. A standard survey questionnaire was employed, but the wording of the specific questions was adapted depending on circumstances such as the stage of mining, and the primary language spoken in each of the communities.

The choice of a survey questionnaire does confront the researcher with challenges such as the commitment and preparedness to ensure that “performance bias on the part of participants due to the presence of the observer” (Chopra et al., 2005, p. 361) is avoided. Respondents may answer questions to impress the researcher. In this case, I took this into account and sought to counteract this by ensuring that interviewees clearly explained their answers, confirming their lived experience in accessing health services. The quantitative data does provide a frame for the qualitative narrative and allows for the identification of different experiences according to specified criteria such as the gender or age groups of respondents.

From the survey responses, a selection of proxy indicators were identified and used for each of the community capitals, and taken together, the measurement of these can provide an indication of the variations in community resilience across the three sites, and the three stages of mine (early, full operational and after closure).

## 5.7 Measuring capitals and resilience

This part of the study design comprises an original methodology derived from existing studies (Magis, 2010; Sabatini, 2009) that is employed to assess the strength of the community capitals in the Bilum Framework, and from this an indicator of community resilience. This method uses the data collected from the applied qualitative and quantitative research methods to measure the level of resilience in the selected mining affected communities in PNG. The variables derived from the survey questionnaire are applied to measure the level of resilience in each community through proxy indicators, based on the experiences of research participants.

An indicator is a pointer that shows what a situation is like in a specific context such as the delivery of health services in mining impacted communities in PNG. More formally an indicator is defined by Magis as a “measure that helps to quantify the achievement of a desired result” (2010, p.24). An indicator then demonstrates how a certain objective or intended result has been achieved towards set targets. Magis (2010) explains this in relation to the measuring of performance through appropriate indicators that cover a range of concepts, from performance measures, input and output measures, ecological footprints and perceptual indicators. Performance measurements are aimed to measure how well something is operating. They include assessing aspects of the effective and efficient operation of a system such as the delivery of health services in mine impacted communities. Perceptual indicators are of particular interest for this study and concern indicators that “measure people’s

attitudes and perceptions which require data collection” (Magis, 2010, p.25). The indicators in this study are primarily perceptual indicators because data on people’s attitudes and perceptions from their experiences in accessing health services in the selected communities are central to answering the research questions. Steadman’s (1999) work provides a useful model for developing subjective indicators that contribute more meaning and understanding of change in a rural community. Steadman used sense of place as an indicator that can identify people’s attachments to their community and services such as health. An indicator, defined by Jordan and Javernick-Will (2013) is an item that can be measured to establish the level of resilience. In this context, proxy indicators are identified to represent the various community capitals as these capitals are composed of multiple factors such as family and kinship relationships that cannot be measured directly through only one aspect. The selected proxy indicators are multidimensional and composite in nature because this will better reflect the nature of the realities being measured. Composite indicators are indicators that are “compiled into a single index [that] should ideally measure multi-dimensional concepts which cannot be captured by a single indicator” (OECD as cited in Prinsen, 2013, p.5). Other studies on the use of proxy indicators to measure community capitals have also highlighted that individual capitals cannot be measured by an individual indicator because their existence or application within a given context would be too diverse to capture in a single indicator (Cutter et al., 2010; Vemuri & Costanza, 2006). For example in this study, several indicators of each of the seven community capitals: political, social, cultural, financial, built, natural and human, are selected to measure the levels of resilience in the mining communities in PNG.

The aim of the development of the indicators was to develop an index or measure of community resilience (CRI) which can then be used to illustrate the trajectory of resilience under different conditions and at different stages of mining. The proxy indicators are used then to provide a measure of the levels of resilience and moreover, provide a focus on the interactions among capitals within the context of the Bilum Framework. The following subsection describes the selection of the proxy indicators for each of the community capitals within the Bilum framework. Table 5.2 presents the seven community capitals, and selected proxy indicators that together provide a measure of the level of resilience in the selected communities. These are not the only measures collected but are taken to each represent a core aspect of one of the community capitals in the Melanesian context and hence are closely linked to the intent of the Bilum Framework. The information from the qualitative research methods has been utilised in the selection of these indicators, as well as providing insights in to the experiences of the communities at Hidden Valley, Lihir and Misima.

Table 5.2: The community capitals and selected proxy indicators.

The Bilum Community Capitals-Community Resilience Proxy Indicators				
Capitals and Questions	Indicator	Proxy indicators		
<b>Human</b> What are your acquired qualifications and training skills?	1. Qualification of people	a. degree b. Diploma c. Certificates : year 12 & 10 d. None		
	2. Number of training courses undertaken	a. Formal from Government b. Mining company c. Spin-offs businesses d. No training		
	<b>Social</b> What type of community activities are you involved in?	1. Organised activities	a. Council work b. Church activities c. Youth and sports d. Two or more	
		2. Informal community engagements	a. Subsistence agriculture b. Community gatherings c. Family meetings d. Two or more	
		<b>Financial</b> Are you formally employed?  What are the other alternatives you engage in to generate income?	1. Employment	a. Government agencies b. Mining company c. Other private employer — spin-offs businesses d. Unemployed
			2. Small scale businesses ( <i>SMEs — i.e. small scale mining, trade stores</i> )	a. Operating formally established business activities b. Selling things of economic value on irregular routines c. Purely subsistence d. None
<b>Built</b> What are the main support services you have in the health facilities?  How do you get to the health facilities?	1. Access to support services in the delivery of health services		a. Roads linking villages and health service b. Water and sewer systems c. Power supply d. Access to all 3	
	2. Available means of transport		a. Ambulance b. PMV truck/bus c. Two or more d. None ( <i>walking</i> )	
	<b>Natural</b> 1. What natural resources do you have access to?	a. Safe drinking water sources b. Land for subsistence agriculture gardening, fishing, & hunting c. Access to mineral resources (gold and alluvial)		

## Building Community Resilience in Mine Impacted Communities

<p><b>Political</b></p> <p>Is there a mechanism to contribute?</p> <p>Which level of power structure did you connect more and make decisions?</p>	1. Formal Community connections to power structure	<p>a. Community involvement in policy making at national level</p> <p>b. Community involvement in decision making at the provincial level</p> <p>c. Local Level Government</p> <p>d. Village court</p>
	2. Informal community groups	<p>a. Women Groups</p> <p>b. Church Leaders</p> <p>c. Youth groups</p>
<p><b>Cultural</b></p>	1. What traditional or indigenous approach do you use to heal sick people?	<p>a. The use of herbs in healing — physical healing</p> <p>b. Spiritual healing — associated with religious beliefs</p> <p>c. Influence of customary values on healing — beliefs on illnesses</p>

Source: Fieldwork (2012).

The identified proxy indicators are focussed on the experiences of people so as to understand the ways in which the various community capitals contribute to building of community resilience in mining-impacted communities in PNG. The subsection below gives the reasons for the selection of these specific proxy indicators.

### 5.7.1 Rationale for the chosen proxy indicators

The selected indicators are proxies for measuring the level of CR in the delivery of health services; they cover a range of aspects (so together are multidimensional and composite in nature), and reflect the local experiences of mining. Concepts such as resilience cannot be measured by an individual indicator because their existence or application within a given context is marked by diversity (Cutter et al., 2010). Resilience and sustainability are related and are complicated concepts to provide a quantitative measure for. Hence indicators need to cover a range of dimensions so as to measure their performance in a particular context (Cutter et al., 2010; Jordan & Javernick-Will, 2013). The techniques applied to measure the level of building resilience



cannot always select indicators, as composite indicators themselves do not always cover all aspects of individual indicators. This was clearly highlighted by Hilden and Rosenstrom (2008), and as such, indicators can also fail to engage those who are intended to benefit. Other challenges on selecting indicators include issues of power and ownership, such as who owns the indicators and influences decision making (Prinsen, 2012).

The proxy indicators used in this study illustrate the experiences of people in the selected mining communities in seeking medical attention. Each of the community capitals and their proxy indicators (see Table 5.2) were selected to represent aspects that relate to the levels of resilience in the concerned communities. The justifications for and relevance of each of the proxy indicators selected for each capital are discussed below.

In terms of pipol, formal and informal indicators including educational qualifications and training, and the contribution and influence from the traditional society are indicators that can influence the extent of people's participation in community projects. In this study people's levels of qualification and training were selected as an indicator to assess the extent to which people can positively participate in community development. Studies on human capital indicate that people's knowledge and skills, and their ability to access resources to develop their communities are important to building resilient communities (Magis, 2010; Poortinga, 2012; Steiner & Markantoni, 2013).

Pipol focuses on networking and partnerships, and the bonding through family and kinship ties that people have and can use to help them access health services. The proxy indicators for social capital in this study target community involvement in activities and include organised activities, informal community engagements and family and kinship relationships. Organised activities refer to formal tasks organised by established agents such as the GoPNG or the church while the informal ones concern community events such as exchange events and gardening activities. For the latter, there are no formal procedures, and people get involved whenever it is convenient for them. Family and kinship ties are specifically targeted to measure the strength of relationships in families. These indicators intend to measure the level of people's engagement within the community, and through this their potential contribution to building resilience. Studies on the measurement and the level of social capital have looked at it as a strong indicator of how people work together and can contribute to making communities more resilient (Emery & Flora, 2006; Poortinga, 2012).

The proxy indicators for kibung were people's access to power structures in decision making in all levels of government: national, provincial and local. These indicators can be used to measure people's participation in decision making (Magis, 2010). These are proxies for people's influence over decisions that could contribute to achieving set goals. The indicators for political capital were especially concerned with the involvement of participants in the planning, implementation and monitoring of health delivery, as well as their input into decisions over supporting services and infrastructure such as road linkages. This occurs through their connections to different

levels of elected politicians, government and informal community groups with influence in the community.

For Wokim Moni the proxies selected were income generating activities as these are a primary source of money in each of the communities. They include sources of funds, such as compensation, royalties, and wages from employment, community economic initiatives in the form of selling items, and charitable funds such as grants from donor organisations. These proxy indicators for income were chosen because these are major income sources in the selected communities and contribute towards people being able to access the health services. Studies on measuring community capitals have indicated that salaries from employment and community investment are critical to building stronger, more resilient communities (Magis; 2007). Financial capital can also be important in linking with and strengthening the other capitals: allowing contributions to exchange ceremonies, for example, will also build social capital in the Melanesian context.

Access to enabling infrastructure such as road links and transport were the indicators for Wokim Samting. The selected proxy indicators for built capital covered road links, transport to the health facilities, support services like water and power supply, and communication channels such as the use of mobile phones. These proxy indicators are selected because they are complementary and support the delivery of and access to health services. A study by Sirgy and others (2010, p. 296) and others on measuring community wellbeing based on perceptions of quality of life elucidated the significance of people having physical access to appropriate health facilities and housing.

The selected indicators for Mama Graun were access to safe drinking water and fertile land. The proxy indicators for these indicators were access to safe drinking water sources such as rivers, fertile land for gardening, and forests for hunting and collecting medicinal plants, and access to mineral resources (alluvial gold). These proxy indicators were chosen because they play a major role in the life of communities in a Melanesian context such as PNG. Other studies (Magis, 2007; Sirgy, Widgery & Grace, 2010) on community capitals have also emphasised the importance of water sources and agricultural land to people's and communities' resilience.

For Pasin Tubuna, traditional approaches to healing through physical, spiritual means and the influence of customary beliefs were selected. These proxy indicators were selected because they represent the cultural practices of healing in the selected communities in PNG. These indicators have also been proposed and applied by other authors (Emery & Fora, 2006; Magis, 2007; Poortinga, 2012). These are associated with the health of people and traditional methods continue to be important to health practices in PNG (Macintyre, Foale & Moktel, 2005; Macfarlane & Alpers, 2008; Kipalan, et al., 2012). This form of capital can contribute to communities' resilience, through strengthening shared beliefs and promoting autonomous health practices. However, the application of traditional approaches can become challenges in specific situations such as complications in childbirth where a preference for traditional approaches to healing may not be of assistance.

Taken together the selected proxy indicators for each of the community capitals provide a way of quantifying them that can contribute to the overall measurement of the strength of resilience in these communities. This study uses these indicators to determine the levels of resilience and provide insights into how changes in these communities' capitals as a result of mining either contribute to or detract from the overall strength of resilience in mine impacted communities in PNG.

The third of the Research Questions seeks to understand how proxy indicators can be used to assess community resilience and community capitals and based on this, to measure the levels of community capitals with regard to delivery of health and other support services in selected communities. The different indicators are also shaped by relevant policy initiatives (Mayunga, 2007), that in turn influence the implementation of the delivery of health services. Policies are developed in the context of both external and internal factors, driven by the interests and expertise of different stakeholders that are based on a combination of sets of assumptions and practical experience (Hsieh, 2013). In this study the National Health Plan (NDoH, 2010), and the MoAs from Hidden Valley (2005), Lihir (1995) and Misima (1990) are analysed to see the commitments and anticipated implementation processes that were negotiated. The application of proxy indicators is also important as this assists in measuring changes in the levels of each community capital. This can help to monitor the effectiveness and the efficiency of the policy implementation process. Effectiveness in this context focuses on resource input in line with the relevant policy initiatives into a particular project or organisation, and at the same time sees how these invested resources have translated into the targeted outcome. Most projects and organisations (Burgess, Pirkis & Baker, 2009; Finch, 2010;

Kightley, Einfeld & Hancock, 2010) focus on indicators of resource input and output for their projects. In the mine impacted communities this can be seen in terms of the funding put into the community health programmes run by the relevant stakeholders including the State and mining companies, and outcome indicators such as the number of health visits including immunisation of children made by the health workers.

Efficiency assesses the level of performance in terms of how well tangible results are achieved in relation to the resource input. An efficient system will see the available resources well utilised at a low cost, and still deliver health services that are of high standards. In other words, efficiency emphasises maximising the level of performance (in terms of the delivery of health services) for the given resource input in the mine impacted communities. The strength of the community capitals and the resulting community resilience are clearly affected by, but also influence, the effectiveness and efficiency of the health system. Hence the Bilum Framework approach does allow for an examination and discussion of these effectiveness and efficiency factors.

The concept of sustainability can also be applied to the health system itself, and here is concerned with ensuring the on-going maintenance of enabling infrastructure including health facilities to ensure that health services are provided to the concerned communities during all stages of mining. This obviously adds to resilience, as these communities are better able to cope with and recover from disturbances in their environment, and enhance their capabilities and assets (Cronje & Chenga, 2009; Sseguya et al., 2009), if they can access continued quality health service. Ideally then, in terms of

sustainability, health services in the affected communities should be maintained and continuously improved from the date of their establishment.

### **5.7.2 Scoring the capitals**

I used simple averages and percentages of the indicators in Table 5.2 to develop a community resilience scale that measures the strength of the community capitals and how this is affected by the experiences of community members of the delivery of health services in this context of large-scale mining. Although this type of simple method is more commonly used to measure disaster risk reduction and democracy (Cutter, Burton & Emrich, 2010; Wind & Komproe, 2012), it can be applied to measure resilience in the mining communities. The Economist Intelligence Unit (EIU) applies simple percentages in calculating scales for measuring community capitals to achieve community resilience (EIU, 2010). In this study the average percentage of each proxy indicator for the community capital is calculated and placed on a scale from 0-100 per cent (see Table 5.3). This structured classification, while not perfect, offers a way of comparing a measure of resilience across the different sites at different points in the community experience of mining. It also makes for an excellent framework for the presentation and compilation of the data from the mixed-methods approach.

### 5.7.3 Calculating a Community Resilience Index (CRI)

In this study a CRI is proposed to measure the strength of resilience and the effects of mining on this community resilience, focussing on the ways in which access to health services can affect the building of resilience in these communities. An index is the composition of “several indicators combined using some mathematical formulae to give a single value called an index” (Mayunga, 2007, p.9). To measure the level of resilience in this study an index is created from the proxy indicators (see Table 5.3). Such indices have been applied in different fields, including disaster, vulnerability, sustainability and resilience. They are also applied in work on poverty, democracy, and human development (Economist Intelligent Unit, 2010; Mayunga, 2007).

The measuring of community resilience continues to be a challenge because there is no universally accepted measuring tool (Cutter et al., 2010; Sherrieb et al., 2012; Steiner & Markantoni, 2013), and, as such different scales like the Baruth Protective Factors Inventory (BPFI), Brief Resilience Coping Scale (BRCS), Connor-Davidson Resilience Scale (C-DRS) (Galea & Ahern, 2005) and others are applied in different contexts. These methods are available, and can be applied to measure resilience. However, these approaches require more extensive, systematised and sophisticated data collection by teams than I was able to do, so as to allow for the data to be statistically manipulated and normalised to enable rigorous discussion of the results. More simply an overall index can be created after the generation and combination of scores (Briguglio, 2003). Therefore, it is important to apply a measurement tool that is both practical, relevant and user friendly to the topic under investigation.



In this study there are three steps of the process in moving from the measures for the proxy indicators for each community capital to acquire an overall CRI for each of the communities. An example is provided below in Table 5.3.

**Table 5.3: Total responses by social capital and its proxies.**

Social capital	Proxy indicators	Total number by responses in MICs.											
		Hidden Valley (N=35)				Lihir (N=36)				Misima (N=38)			
	N=109	Count	Av <sup>16</sup>	%	Proxy	N	Av	%	Proxy	N	Av	%	Proxy
	<b>1.Organised activities</b>												
	a. Involved in only one activity	15				8				8			
	b. Involved in two or more activities	20	0.6	60		28	0.78			30	0.79		
	<b>2.Informal community engagements</b>												
	a. Involved in only 1 activity	10				9				9			
	b. Involved in two or more	25	0.71	71		27	0.75			29	0.76		
	Proxy Indicator for Social Capital (average of the two percentages)				<b>66</b>				<b>77</b>				<b>78</b>

Source: Fieldwork (2012).

**Calculating the measure of a single capital in one community**

The example above is for Social capital across the three sites and it shows that there are two proxy indicators, derived from those indicated in Table 5.3: (i) percentage of people involved in 2 or more organised activities; and, (ii) percentage of people involved in 2 or more informal community engagements. These indicate the

<sup>16</sup> Av stands for average.

proportion of people surveyed who are well connected through either formal or informal forms of community organisation. The average of these two percentages provides for an overall proxy measure of social capital for each of the three communities.

***Calculating the overall CRI for each three communities***

The process above is repeated for the other capitals. To calculate an overall CRI, the average scores for the seven selected proxy indicators are summed up and are divided by the 7 community capitals. This figure is then an overall percentage which can then be scaled against the selected cut-off ranges as presented in Table 5.4. The cut-off ranges were adapted from Ungar and Liebenberg (2011, p.139) to accommodate the varying percentages in the selected proxy indicators for this study.

**Table 5.4: The cut-off ranges for overall CRI, by percentages.**

Level of Resilience	Cut off Range
Very High	100 — 91
High	90.9 — 70.9
Average	69.9 — 40
Low	39.9 — 19.9
Very Low	19.9 — 9.0

The cut-off ranges in Table 5.4 are appropriate because they assist in describing the spread of percentages from the selected proxy indicators. A higher proportion of the cut-off percentages ranges are concentrated in the average — low range to ensure that more careful examination of proxy indicator is carried out prior to the measuring of community resilience. By using the same methodology across each of the three communities, this allows for the systematic comparison of community resilience by community and stage of mining.

## 5.8 Ethical issues

The ethical issues in research are the moral principles that guide how a researcher conducts him/herself while carrying out research in the field. In this research while there were a range of ethical issues that were of importance to all parties, the key issues that I focus on are the formal ethics procedures, obtaining informed consent for research participants, access to and use of information, and community contributions.

### 5.8.1 Official ethics procedures

The formal ethics procedures for this study are underpinned by the research ethics requirements of Massey University (MU) Guidelines for Low Risk Notifications (<http://massey.ac.nz>) and the relevant stakeholders in PNG who were investigated for this study. Consideration of ethical issues before field research is important as it can protect human participants (Coup & Schneider, 2007) in harmful situations such as civil unrest encountered by all parties including researchers and interviewees. Prior to the fieldwork, an internal review of the ethical issues around the work was carried out with three Development Studies staff members, and on this basis it was decided that the field research approval would proceed via a Low Risk Notification (LRN) request to the Massey University Human Ethics Committee (MUHEC). This was accepted and approved by MUHEC. A copy of this approval letter is included in the thesis (see Appendix 1). The LRN process was important because it made me think through issues such as recruitment, privacy and confidentiality, informed consent, handling of data,

safety in the field, for example, and it also prepared me to some extent for possible issues such as making decisions on community participation during data collection.

Permission to conduct research in PNG was also sought from the NDoH, MRA, DMPGM, DoNPT, Milne Bay Provincial Government, mining companies, district administrators and district health officers in the selected communities. Letters were written to each of the relevant organisations to obtain permission to undertake the research (see Appendix 2 for Sample Letters). Permission to approach employees and staff members was sought through authorised personnel from within each of the identified stakeholder groups. These letters were delivered to the relevant authorities prior to data collection. All of the organisations granted me permission to interview relevant personnel, subject to the informed consent of those individuals.

### **5.8.2 Obtaining informed consent**

The data collection in this study involved interviews with participants from each of the relevant stakeholders. All participants, in the different areas, for example the MICs and the various government agencies, were informed of the purpose and process of the study prior to the actual interview. The “informed consent of research participants is ethically and legally required for most research involving human subjects” (Joffe, Cook, Cleary, Clark & Weeks, 2001, p.139). The background to the study and its significance was explained to potential participants and I made sure that they had a clear understanding of the intentions of this study. Potential key informants who were in offices were contacted prior to the interviews to ensure that they understood the

purpose of this fieldwork. These individuals were told they had the right to refuse to participate in the research. It was made clear to the participants that they had the right to withdraw from the research at any point, and they could choose not to answer any of the questions asked. Hence potential interviewees all made an informed decision regarding their involvement. No one was pressured into participation.

Additionally, I made sure that the language used was not full of jargon (Ingelfinger, 1979, p.265) so the participants could understand. I made sure my style of communication and language use varied according to the different contexts. For example, when talking to relevant senior personnel in the government offices and Newcrest officers in Lihir both English and Tok Pisin were used depending on which language the interviewee preferred. The description of the project and other explanations was done mainly in English to the mine employees, government workers and those who could speak this language. In the mine impacted villages Tok Pisin was used. Only on one occasion when I interviewed an elderly woman who appeared to be in her 70s I engaged an interpreter when neither my interviewee nor I could speak a common language.

### **5.8.3 Use and access to information**

Several government agencies showed interest in the results of this study, and were told that this thesis will be available through the MU Library online after it has gone through all the required processes. In a way the thesis may be collectively owned by the researcher and relevant stakeholders due to the fact that without each one of

them there would not be a thesis. However, I understand that sensitive information collected in the course of this study which could cause potential problems to participants and organisations involved, and this has been kept confidential to avoid compromising those stakeholders' social, political or private integrity.

#### **5.8.4 My position as a researcher**

The term 'position' is used in two senses in this study; first as a professional who deals with disadvantaged populations, I had to ensure that I did not approach any of the participants or impacted communities with perceptions I formed in other communities. For example, I went to these offices and communities with an open mind so I could as objectively as possible collect the data I required for this study. I sought to avoid prejudices by focusing more on the data and not allowing myself to be judgemental over the responses from the participants. Secondly, as an indigenous Papua New Guinean, especially a woman, I am confronted with both the insider and outsider dilemmas (see Paechter, 2013). I am an insider because I am a Papua New Guinean and an outsider to the respective government agencies, mining companies, and the MICs because I do not belong to any of them. Although I have been to Lihir, one of my selected communities, in 2009, I had no relationship with Newcrest Mining Company or the community. Being an indigenous woman, I had to also be mindful to follow the correct protocols and procedures when talking to male participants or the community elders. Building trust from the community was important (Baumbusch, 2011) to ensure that data collected was reliable.

Certain cultural protocols and procedures in some communities were important to maintain and follow accordingly. For example in Lihir I made sure not to enter the men's house or even attempt to seek permission to go in there.

## 5.9 The limitations of the study

Three main limitations can be seen in this study and were largely practical in nature. Primarily due to logistics I had some difficulties during the data collection, and these pose limitations in terms of the thesis speaking to broader issues of community development, sustainability and resilience.

Firstly, the empirical analysis focused only on the impacts of the mining industry within three selected communities. A comparison of community resilience across sectors could have been enriched by the collection of data if it had looked at communities affected by non-mining industries. For instance, it will be of great interest to contrast the impact of mining with those communities affected by agri-business (such as oil palm), as it will likely identify the differences between these two industries on land, incomes and infrastructure, and the different ways in which community capitals are affected. The nature of the research questions, time and financial resource constraints however restricted this study to focussing only on the mining industry.

Secondly, while the initial intention was to do an empirical study based largely on case studies from three different sites; only one site was able to be completely investigated. This was due to two reasons: the absence of one relevant stakeholder (the developer)

in one of the research sites (Misima), and the delay in accessing the field site and participants at Hidden Valley. This meant I was only able to collect data from one developer/mining Company on site (in Lihir). To help overcome this, the study triangulated research methods to collect relevant data based on qualitative interviews, grey literature and participant observations to deepen my understanding on this particular stakeholder across all three research sites. Document analysis in particular was used to support the findings regarding corporate activities from Newcrest, Lihir, and apply them more widely across the other sites.

Finally, logistical problems including a lack of access to transport and time wasted waiting for key informants that were encountered at different points during the course of the fieldwork. A lack of transport caused difficulties that consequently led to other issues like delays in the overall time scheduled for this research, thus accumulating additional expenses. It was a common problem in government offices to make an appointment for transport only to find at the time of departure that the driver had left or some other event had happened. On many occasions, appointment times were not observed by some interviewees who gave reasons such as attending to other duties or forgetting about the appointment. Numerous appointments were consecutively cancelled and rescheduled. Waiting time for the same informants ranged from 1-5 hours in a day or even weeks. Despite the extension of the research time, a number of key informants within various government departments and statutory bodies especially in Port Moresby were never interviewed due to this non-attendance.



## 5.10 Conclusion

This chapter presented the approach adopted in this research, and the methods used to collect and analyse the data. The comparative case study approach was significant as it provides the ability to broaden the discussion of the findings regarding the delivery of health services and community resilience beyond a single site. The selected case studies also spanned different stages of community exposure to large-scale mining.

Through the triangulation of methods — some qualitative and some quantitative — a more comprehensive and reliable picture was gained. Hence the qualitative research methods enabled an understanding of people's experiences in their local settings, while the quantitative approach was more focussed on generating numerical data allowing for the measuring of resilience across the different mining communities. The qualitative research approach was important for capturing the experiences of the community members in terms of their access to health services in their communities. This also provided appropriate data for reflection in relation to the Bilum Framework, and enabled greater understanding of the building of resilience within the mining communities in PNG.

In terms of the quantitative approach, the survey questionnaire was used for the collection of information on the interaction of the community capitals in the impacted communities and this allowed for a more systematic understanding — within the context of the Bilum Framework — of the processes by which health delivery in mine-

affected communities can affect community resilience. The survey questionnaire was designed primarily to answer Research Question 3. The questionnaire was targeted to collect information from the users of health services, and the use of these figures allowed me to quantify the level of resilience across the three communities, through the development of proxy indicators. These figures set the bases for the assessment on the CRI which are supported by the material collected from the qualitative research strategy.

This chapter also presented the assessment methodology based around the community capitals that will be applied in this study to measure the levels of resilience in the impacted communities. The proxy indicators derived from the community capitals are identified and will be used to determine the levels of resilience in each of the communities. Finally, the chapter also outlined the research participants, ethics, and the limitations of this study. The next chapter presents the findings from application of the quantitative research approach and methods.



## Chapter 6

# Building community resilience through community capitals

### 6.1 Introduction

This chapter presents the findings collected using the quantitative research method to explore the constraints on the delivery of health services. In doing so it specifically addresses research questions two and three which are concerned with the constraints that prevent the building of resilience and how community capitals can be used to assess the level of resilience through the delivery of health services in the communities impacted by mining. The chapter draws primarily on the survey questionnaires administered to 62 community members and their partners totalling 109 people, in the selected communities in PNG. The survey questionnaire was used to collect community members' views about their experiences on the overall delivery of health services. The survey attempted specifically to target the communities' views regarding access to services, including the enabling infrastructure that facilitates this access, the challenges in accessing these services and the strength and extent of interaction between the various community capitals. These community capitals, as noted earlier, are argued in the literature to be closely associated to the building of community resilience (Emery & Flora, 2006; Flora & Thibourmery, 2005; Jacobs, 2007; Magis, 2007). In this chapter the interactions between these capitals are conceptualised as giving strength to community resilience in the context of the Bilum Framework that represents resilience in the Melanesian context.

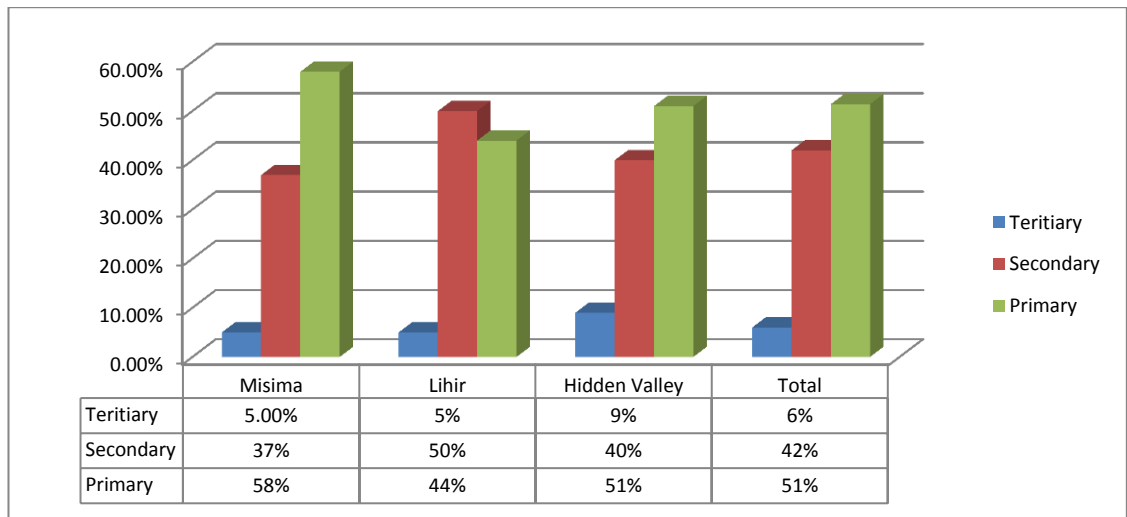
The chapter is structured around five sections. After this introduction, the first section, 6.2 presents data on education and training within each community as an indicator of the level of human capital; section 6.3 covers community engagement of the surveyed population which provides a proxy for the strength of social capital, while section 6.4 outlines the community members' perception of access to health services. Section 6.5 presents the community assessment of survey results regarding the proxy indicators developed in the previous chapter that illustrate the strength of the community capitals. This section also illustrates the Community Resilience Index (CRI) of each of the selected communities. This is then picked up again in chapter eight to explicitly develop a Community Resilience Index for the three communities with reference to the stages of mining (see Chapter 8). Section 6.6 concludes this chapter.

## **6.2 Levels of education**

This section attempts to understand the level of education and the types of training community members have undergone as a central element of the building of human capital. As noted above, the literature indicates that higher levels of human capital can better contribute to development and building resilience in communities.

The levels of education are divided into primary, secondary and tertiary qualifications. Tertiary refers to members who have degrees, diplomas or other qualifications from tertiary institutions; secondary education concerns those who achieved between grade 12 or 10 education from a secondary or high school, as these are currently the

certificate grades in PNG’s education system. Primary education indicates members who achieved some form of primary education up to grade eight or below. Figure 6.1 provides the information on the levels of education achieved, by the numbers of interviewed community members for each mine impacted community.



**Figure 6.1: Qualifications, by level of education and community.**

Source: Fieldwork (2012).

### 6.2.1 Primary

Primary education refers to those who spent a maximum of 6 to 8 years in the primary schools, and to those without a certificate as many leave school at an early age due to family values and/ or poor access to schools. Figure 6.1 shows that overall 51 % people had achieved only primary level education. Lack of support services such as road links and the rugged terrain of the country appear to contribute to children not being obligated to completing primary education. As Pincock (2006) describes, PNG’s rugged terrain contributes to the difficulties encountered by many to access services. Several studies revealed that the retention rate of children completing primary education

successfully in PNG is low (Guy, 1999; Rena, 2011). In many ways, having too many members with only primary education can be a disadvantage for communities. One of which is the limited understanding of community development issues and its impact on the building of community resilience. The level of education in these communities also reflects the low literacy rate in the country. The Human Development Report (Banks, et al., 2014) clearly shows that PNG has a low literacy rate of 60.6%. It appears to be the lowest amongst the South Pacific countries. PNG also has a low mean in the number years of schooling (3.9) while the expected years of schooling (in terms of current education policy) is 5.8 (see also Malik, 2013). Within the four global ranking categories for school attendance of very high, high, medium and low, PNG sits in the low category (Malik, 2013). The results of this study reflect general patterns, with a high percentage of interviewees only having limited primary qualifications as well as low levels of functional literacy<sup>17</sup>. This indicates a low priority accorded to education and is a constraint to the building of human capital in the mining-impacted communities. This is even more problematic where people have low functionally literate skills to read and understand development issues such as health effectively and are unable to take preventative measures, and hence build more resilience livelihoods and lifestyles.

### **6.2.2 Secondary and tertiary education**

Figure 6.1 also shows that overall 42% of the interviewees had completed either grade 10 or 12. Within this secondary level there were more grade 10 qualifications in all the

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<sup>17</sup> Functional literacy concerns the community members' competency in their comprehension on reading, writing and numeracy skills.

selected communities than grade 12. Many of these grade 10 leavers indicated they had no other formal qualifications. The percentages varied across the three communities from 37% at Misima to 50% on Lihir and 40% at Hidden Valley.

According to Helliwell & Putnam (2007) education is important in building a community's capacity and it is a predictor of the community engagement that can contribute to the strengthening of resilience. Despite that, it can also be argued though that just raising the level of education in the mining impacted communities may not be the answer to effective community participation to build resilience because these communities may need a curriculum that is more relevant to their needs and priorities (Galston, 2001). Regardless, a level of education (beyond basic primary) could be an important precondition for building human capital so as to contribute more effectively to stronger, more resilient communities.

All communities had only a low percentage of interviewees with tertiary qualifications. Tertiary education is a priority in the GoPNG's education policy (AUSAID, 2012), but this is not evident in the selected communities. Tertiary education plays an important role in preparing community members to be able to plan and implement development activities that can contribute to the building of community resilience in their respective communities. A study on tertiary education revealed that community members with higher education qualifications can make more positive contributions to community development (Bloom, Canning, & Chan, 2006) while other studies (Lawson, 2005) emphasise the integration of specialised tertiary education (such as preventative measures on diseases) and managing available resources (such as finances) are



required to build resilient communities. Therefore, it is important to develop the human capital of the community with tertiary qualifications to promote a better understanding and more effective contribution to community development projects. But formal education is not the only way to strengthen human capital, especially in PNG, and the next sub-sections present the results with reference to skills acquired through both the formal and informal training offered by the different stakeholders.

### **6.2.3 Training and capacity building**

Formal training for capacity building includes short courses such as literacy and health awareness that impart new skills. It also includes the organised training offered by government agencies, mining companies and other organisations. This may include training on health and other skills that can contribute towards accessing better health services, as well as employment and income-related skills such as small-business management and financial literacy.

Training can also play a direct role in enhancing the human capital within communities and improving the overall health status, through basic training and education courses on preventative measures in disease control and health and sanitation. In health service delivery, promotion of capacity building is paramount as this enables a continuation of the provision of effective and efficient health services (Hawe, et al., 1997). These skills are also important as they enable individuals to contribute meaningfully in a variety of ways to the development of their communities. Table 6.1

shows the extent of training undertaken by respective provider, for the interviewees in Misima, Lihir and Hidden Valley.

**Table 6.1: Training, by provider and community.**

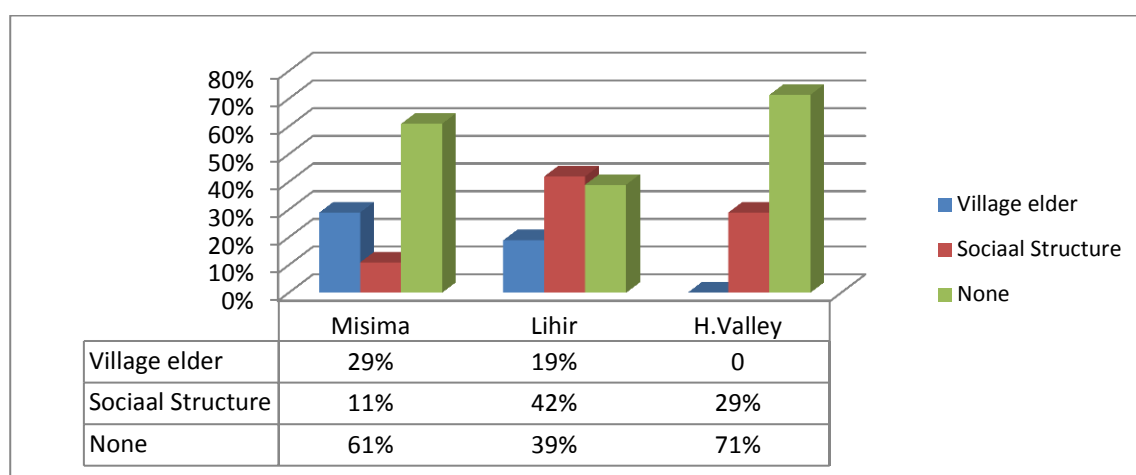
MICs	Training offered by:								
	Government Agencies	%	Mining Company	%	Other agents	%	No training	%	Total
Misima	5	13.2	7	18.4	12	31.6	14	36.8	<b>38</b>
Lihir	12	33.3	8	22.2	3	8.3	13	36.1	<b>36</b>
Hidden Valley	8	22.9	7	20	15	43	5	14.3	<b>35</b>
<b>Total:</b>	<b>25</b>	<b>23</b>	<b>22</b>	<b>20</b>	<b>30</b>	<b>27.5</b>	<b>32</b>	<b>29.4</b>	<b>109</b>

Source: Fieldwork (2012).

These results revealed some differences in the number of training programmes carried out in the different communities, by relevant stakeholders. People on Lihir had received more training from the government agencies in comparison to Hidden Valley and Misima. A study on personal viability (Haro, 2010) shows Lihirians undertook training to improve their livelihood opportunities. Lihir and Hidden Valley showed 33.3% and 22.9%, respectively, by government agencies and 22.2% and 20% by the mining companies. Results further revealed that Misima had lower percentages of training by both the GoPNG and mining companies, but the extent of training run by other agents – primarily the church – was higher. In Hidden Valley, 43% of the training was supported by programmes from ‘other agents’, in contrast to Lihir with just 8.3%. This could imply that the GoPNG gives priority to the operational stage of mining; neglecting the other two phases of development. A coalition of stakeholders in providing skills training could positively build on peoples’ existing skills, knowledge and attitudes (Foster-Fishman et al., 2001) to further enable them to strengthen and build resilience of their community.

### 6.2.4 Informal training

Informal training refers to training activities carried out in community settings, including cultural practices associated with healing, fishing and hunting skills, weaving baskets, and knitting Bilum among other things. In terms of health, it can also refer to the different skills involved in identifying various herbal plants and understanding their uses in treating diseases. Figure 6.2 illustrates the main types of informal, culturally-based training offered by village elders and that which occurred through kinship and family connections within the community.



**Figure 6.2: Informal training, by community and provider.**

Source: Fieldwork (2012).

Figure 6.2 reveals that the pattern of these informal community-based trainings varied by community. Informal kinship based learning was present across all three communities, from a low of 11% on Misima, to a high of 42% on Lihir. Overall Lihir had more people participating in activities within the community. These results could imply the interviewees’ had stronger interactions with their communities’ social and

geographic setting and a sense of social belonging, and that this learning is a reflection of this. On Misima and Lihir, only 29% and 19%, respectively, had received informal training or education from village elders, while at Hidden Valley none of the interviewees indicated any informal training from village elders, as they were mostly migrants from all over PNG. The low results in Hidden Valley could also be related to the fact that a higher percentage of interviewees were involved in training provided by other modern stakeholders such as the church and government agencies or they were heavily involved in activities such as small scale mining (see Chapter 3). Alongside the fact they do not have the relationships with the local elders due to in-migration they may also not be inclined to participate in the informal training opportunities by village elders. These results mirror the limited organised community activities and there was a lack of interactions among the village elders and the other younger community members in this community. This could also have detrimental effects on the building of social capital. Studies by Handley, Sturdy, Fincham & Clark (2006); McMillan & Chavis (1986) highlighted that people learn from being part of the community, they learn by participating, and this is positive in terms of building human capital which can further lead to effective participation in community activities.

### **6.2.5 No training**

Findings as presented in both Table 6.1 and Figure 6.2 reveal that many of those interviewed do not get involved in training of any kind. Despite the different stakeholders offering training in Hidden Valley, a high 71.4% of the interviewees indicated that they had not undertaken any training. While the percentages vary in the

different communities, Misima also showed a higher percentage of non-involvement, and this could reflect a lack of emphasis placed on the importance of developing human capital among the youth.

In terms of unpacking the training many respondents highlighted that there was a lack of informally organised training opportunities in their communities. This appears to indicate that the partners such as village elders and government agents in these communities do not see the significance of helping the communities acquire skills through training, or that the development of human resources within these communities is not considered to be important. For Misima and Hidden Valley the results indicate that half of their populations are not currently involved in any organised training activities. The lack of investment in organised training detracts from the building of community resilience. While informal training is voluntary and often more available, people may not value the significance of this training. This is in opposition to the literature which highlights the importance of informal training for raising levels of human capital in contributing to the overall development of communities. Moreover, several studies (Mansuri & Rao, 2004; Paul, 1987) on training and community development demonstrate clearly that government training strategies can complement other stakeholders' training programmes and contribute to the building of resilience in all stages of mining.

Levels of education and formal training reflect the development of human capital, and the data above (Figure 6.1) shows a high percentage of interviewees were without secondary school certificate: Hidden Valley and Lihir showed over 50% each while

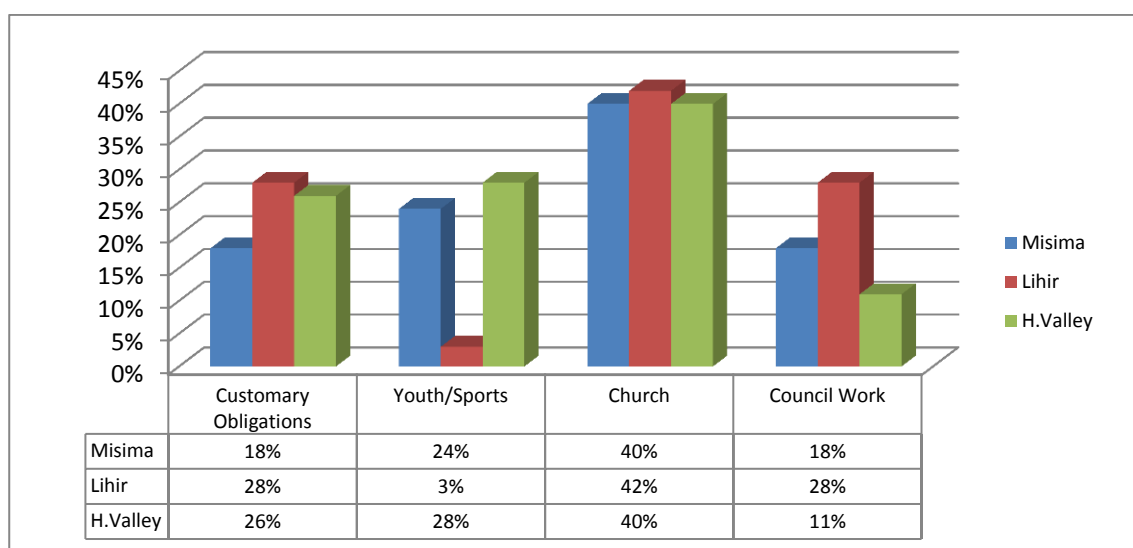
Misima had 45%. And while Table 6.1 has includes evidence that a significant proportion (70%) of interviewees had received formal training, when this data is broken down further higher percentages have received general training such as carpentry and other technical training rather than the specific training on health and social issues (such as dealing with alcohol consumption and domestic violence) in the three communities. Together these results provide evidence that populations within these mining communities have limited access to specialised health training, on issues such as the prevention of waterborne diseases. Lack of preventative measures can lead to outbreaks of diseases that could be difficult to contain by the available health services (Beaglehole & Yach, 2003; Tobler, et al., 2000). This can be a serious issue if there is limited capacity to comprehend and prevent such waterborne disease from spreading amongst the local population.

Both informal training and formal training including short courses and awareness programmes on health issues contribute to the building of capacity. Capacity building contributes to the building of resilience and consequently to achieve sustainable communities with effective delivery of health and other services.

### **6.3 Engagement in organised community activities**

Community engagements here refer to the participation of interviewees in activities within their community. In Melanesian cultures, people are typically obliged to participate in customary forms of exchange, and many likewise participate in church gatherings or other community activities, such as sport or council work ( cleaning the

village, for example) — Local-Level Government through the ward councillors directed work to maintain or improve facilities within the village. Taken together, these activities are a reflection on and reinforce social capital within the community, and show the extent to which community bonding can help with the effective delivery of services including health. Figure 6.3 outlines people’s participation, by different types of community activities.



**Figure 6.3: Engagement in community activities, by community.**

Source: Fieldwork (2012).

Figure 6.3 shows the main activities of the interviewees in their communities, and the data includes individuals’ participation in several activities. In all three communities, church-based activities dominated. Other studies on community engagement (Manderson & Mark, 1997; Rolfe, 2006) illustrate the importance of connectedness in order to assist in establishing stronger social capital, which in turn is critical for building resilience. Hence it is important that a community has programmes such as identifying CAM available for its community members to become involved in to foster and build

social capital in culturally specific ways bringing positive changes. Studies by Bainton (2008, 2010) on the cultural practices in Lihir also supported the importance of customary events such as feasts that connect community members in Lihir and other Melanesian societies. Other studies on Melanesian cultural practices further support the potential of church activities in bringing different community groups including women together (McDougall,2003).

### **6.3.1 Customary obligations**

Customary obligations here refer to the members' traditional duties that they are culturally required to fulfil, and involves customs and special rituals such as initiations in fishing, hunting and engaging in healing, funerals or traditional feasts that only certain members can perform. Figure 6.3 shows that Lihir had the highest percentage of community involvement in these (28%) and Hidden Valley was the second highest (26%), while Misima had the lowest proportion of participants (18%). Of value however is that all the communities had some people who are involved in these special customary activities. The results from this study indicated that the interviewees in Lihir were the most involved in their cultural activities, particularly funerals and other feasts. The significance of customary obligations such as feasts and traditional forms of healing are also emphasised in the literature (Bainton, 2010; Bainton, Ballard, Gillespie, & Hall, 2011; Haro, 2010; Macintyre, et al., 2005). The continuing significance of these practices' existence despite the long-term presence of the mine operation indicates an on-going level of resilience. The learning that comes from this involvement contributes to the building of cultural and social capital in relationships,



providing strength and enabling communities to maintain their indigenous approaches to a range of issues, including healing.

As noted above, in this study cultural capital is indicated by the traditional approaches to healing used within the mining impacted communities. The customary obligations indicated in the Figure above (6.3) include some of these. As will be noted later, these customary health practices continue to be widely used across all three communities.

### **6.3.2 Youth and sports**

Youth and sports activities exist widely across Papua New Guinea, and typically refer to any formal groups or associations that youth are actively affiliated to within their communities. Figure 6.3 indicates there is a big difference in the percentages of youth involvement in sports in the selected communities. Responses from the interviewees showed that Misima and Hidden Valley have higher involvement of people in youth and sport activities compared to Lihir. In Lihir, youth and sport activities within the landowner villages were less prominent, while Hidden Valley and Misima had more youth participation (23% and 24%, respectively). There seems to be a relationship between the involvement in community youth sports activities and the different stages of mining, with most people on Lihir apparently more engaged in mining-related activities such as being employed in manual jobs, or at school. From here we could assume they have little time to participate in community sport and youth activities. In Lihir, a complicating factor is also that company-run sports and youth activities may not be captured in this survey, and so it could be that youth are more interested in

sports and other youth activities organised by the mining company and tend to see little significance in activities organised within the village.

Youth participation in community activities is important as it is argued to empower young people. These activities provide avenues where young people can learn skills such as leadership and team work that can contribute towards the development of their communities (Vaughan, 2014). In contrast, if youth are exposed to activities such as excessive alcohol consumption and violence it detracts from building a positive community milieu and also directly leads to poorer health outcomes. Fanthorpe and Maconachie (2010) for example, show that when young people in post-war Sierra Leone were disempowered they more easily embraced conflict. Young people play an important role in bringing about change within their community (Singleton, Rola-Rubzen, Muir, Muir & McGregor, 2009). Therefore, the government and Mining Company acknowledge it is important to engage the PNG youth in activities that will build skills and social networks and distract them from engaging in more harmful pursuits. Sports have been proven to be an effective means for building social networks in the South Pacific (see Gegeo & Watson-Gegeo, 2002).

### **6.3.3 Church**

Church activities include Sunday services and church-based women's groups. Overall, church activities, as indicated in Figure 6.3 are the most common form of community engagement in all the mine-impacted communities. Lihir had the higher percentage of involvement (42%) while both Hidden Valley and Misima had 40% each. The churches

appear to be well organised and coordinate their activities effectively. It can be argued that churches are organised to entice people to come for worship; or that they are seeking to ensure that the communities overall well-being is taken care of. It is widely noted throughout PNG that churches play an important role in influencing the people to participate in a wide range of community based activities such as youth sports and women groups (see Anderson, 2012; Douglas, 2007).

#### **6.3.4 Council work**

The Council is the lowest level of GoPNG representation, and occurs within the bounds of a Local-Level Government (LLG) Ward. The LLG exists as a group of elected Councillors who usually coordinate village affairs at the behest of the government under the OLPGLLG Act (2005) within their respective wards. In this context there is one elected councillor per ward. The Council also runs community or village activities. Figure 6.3 reveals that Lihir has the highest percentage of people who are involved in council work (28%) with Misima (18%) and Hidden Valley (11%), respectively. It appears that most interviewees were not particularly keen to do council/community work in the communities. This could reflect a lack of respect for government authority, an issue that is widespread in many parts of PNG. On the other hand, it could also imply a lack of leadership to mobilise effective participation in activities organised by the ward councillors, or that not much needs to be done by the Council. A study by Raco and Flint (2001) on local level governance showed that this level of government is given little attention by the national and provincial government agents. It is also commented and can be observed that in many respects the mining companies act as

the governing authorities within these mining communities (Cheshire, 2010). This raises the issue of the limited longevity for mine-based infrastructure and facilities, as after mine closure it is important for the GoPNG to retain and maintain this infrastructure through the local level authorities and the ward councillors.

With respect to the perspective of Bilum Framework, social capital is interacting here to produce positive results for community participation. Families in these communities have strong kinship linkages and reciprocity which consequently results in them assisting each other to access health care. When the families need help, community members step in by assisting with transport or help to carry the sick to the health facility depending on the seriousness of each case. Other studies (Strathern & Stewart, 2000; Wiessner & Tumu, 1998), confirm that kinship and reciprocity in PNG plays an important part in the maintaining of relationships in the community. In fact, this is a significant practice in the existence of a Melanesian society where people in the community support each other through family ties or the wantok system<sup>18</sup>. Some authors (Aas, Ladkin & Fletcher, 2005; Healey, 1998) further support the view that strong links among stakeholders are important in effective service delivery and community building and this in turn reinforces the Melanesian forms of support systems within these communities.

Community engagement is vital for the building of a particular community's resilience through this engagement, community member's level of knowledge and understanding enables them to choose to participate or not participate (Dudley &

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<sup>18</sup> Wantok system is a PNG Tok Pisin concept that refers to the practice of people giving support to those known to them through kinship and other social networks.

Gitelson, 2002). A longitudinal study by Zunzunegui, Alvarado, Del Ser, and Otero (2003) on social networks, social integration, and social engagement revealed that lack of community engagement can cause community members to develop negative attitudes towards community participation which can detract from the strengthening of resilience.

In sum, then, the survey found that the levels of education and community engagement were generally low across all three of the impacted communities with the majority only having primary level education, and there was limited engagement in both formal and informal training. Furthermore, the results show that there were many people not engaged in community activities, apart from church activities, and even the role of the ward councils was largely unsupported. These results demonstrate there to be a trend towards poor planning in building human, social, and cultural capital which makes the building of resilience more difficult. The next section presents the perceptions of the interviewees regarding accessibility to the available health services in the three mining-impacted communities. This in part reflects the discussion above of the development of human and social capitals.

#### **6.4 Accessing health services at the different stages of mining**

As discussed in the design of the study (Chapter 5), people were asked to assess their experiences of accessing health services in their community. These experiences encompass the ease with which the interviewees can get to the different levels of health services, having sufficient finances to pay for transport and health services. The

study also asked for their assessment of the quality of the available health services. This is significant so as to be able to determine if the delivered health services are relevant to the needs of the people, and if they can be accessed by community members.

The responses are presented by community members, and reflect the different stages that each of the mining operations are at: Hidden Valley-early operations, Lihir-established, and Misima-after mine closure. Each of the communities reflected on their current situation and compared the challenge they currently faced with their experience or expectation of the challenges for the two other stages of mining: i.e. on Misima people were whether they anticipated these challenges were likely to be greater for the current situation, the 'before mining', or the 'during mining' situations. The following subsections present each of the communities' perceptions organised around two themes: (i) their access to the available health services, and, (ii) the challenges they encounter in accessing health services. Challenges are presented under the headings: lack of finances, non-availability of transport, preference in the use of traditional methods and non-availability of biomedical health services. It is important to understand that the interviewees' preference in the use of traditional approaches can either contribute to or undermine the building of resilience. It is a positive contribution to the building of cultural capital especially in terms of maintaining traditional way of healing illnesses but can at the same time be a challenge when people's preference is for traditional approaches for serious medical conditions such as birth complications which can cost lives. As such, preference for

traditional methods is seen as a challenge in the following section under each selected mine.

### 6.4.1 Hidden Valley: Early operational mine

The Hidden Valley mine is in the very early operational stages, having commenced operations in 2009. Responses sought from the interviewees focused on the current situation at Hidden Valley, but also included their views on their expectations regarding changes during the mine operation, and what they anticipated would be left behind after mining in terms of the accessibility of health services. Table 6.2 provides the responses from Hidden Valley in relation to the challenges of accessing health services and their perceptions on the future including during and after mine closure

**Table 6.2: Challenges of accessing health services, by stages of mining**

Challenges	Very early stage (current)	Perceptions Established (During)	After mine closure	Total
Lack of finances	8 (40%)	5 (25%)	7 (35%)	20
Non-availability of transport	10 (50%)	3 (15%)	7 (35%)	20
Prefer the use of traditional methods	8 (40%)	4 (20%)	8 (40%)	20
Non-availability of health services	11(55%)	6 (30%)	3 (15%)	20

Source: Fieldwork (2012).

Table 6.2 shows that 55% of the interviewees feel that the challenge of health services not being available is greater currently, compared to what they think the future holds in later stages of mining. Likewise 50% felt that the challenge of no available transport to travel to the health services was greater currently, and expected this to improve as the mine life continued. It also shows that 40% of the interviewees believed the lack of

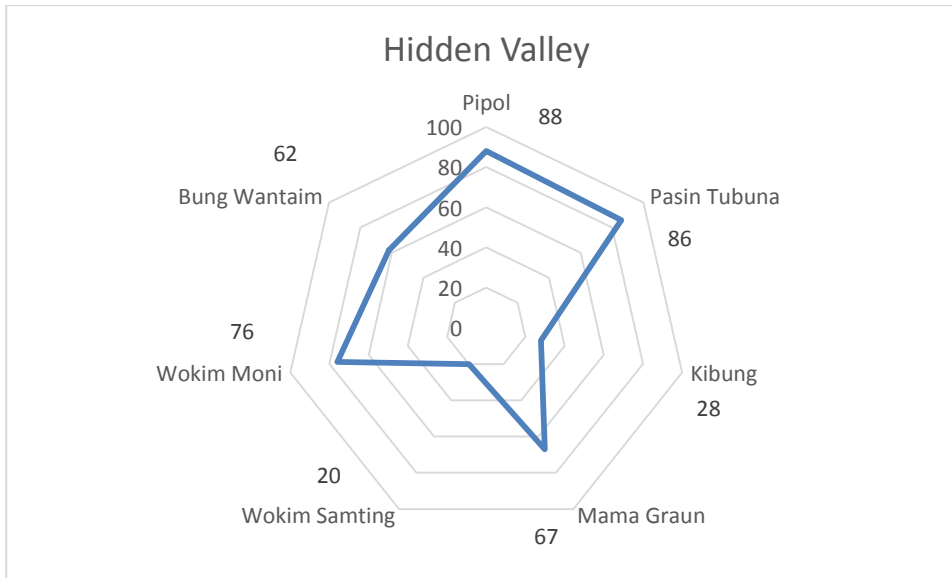
finance to pay for the required health services is greatest at this stage. Many of these families stressed the hardships in accessing transport to get to the available health services. They also indicated the hardships encountered because of the non-availability of health services within some of their villages, and further emphasised the bad road conditions (compounded by the rugged terrain) that makes transport difficult. A community profile on access to services in PNG by NRI (2010) confirms these results and shows that on average services in rural areas can be reached within 8 hours of walk. Other studies (Müller, et al., 1998; Noor, Zurovac, Hay, Ochola & Snow, 2003) further confirm the difficulties and hardships associated with accessibility to appropriate health services in rural settings faced by communities.

The other feature that is highlighted by the results is the interviewees' current use of traditional healing approaches such as the use of specific herbs and plants. Table 6.2 shows that the bulk of the interviewees felt that their use of traditional healing methods would be lower during mining than currently but was likely to be equally high in the post-mine phase. Other studies by Kipalan, et al. (2012), and Macintyre, et al. (2005) also confirm that traditional approaches to healing illnesses are still widely used by people in PNG. Respondents perceived that there would be a decreased preference for traditional medicines as mining becomes more established which may indicate that people expect access to modern health services to improve as the mining develops, but then to fall away again in the post-closure phase.

The interviewees compared across the 3 stages of mining and anticipated that in the future stages of mining the challenges of accessing more effective and efficient health



services would be reduced, however, these the challenges would again rise when the mine closes. In other words, the interviewees think that they will encounter more challenges after mine closure.



**Figure 6.4: Overall interactions on community capitals in Hidden Valley.**

Source: Fieldwork (2012).

Figure 6.4 shows the Bilum Framework level of community resilience at Hidden Valley based on the proxy indicators as developed in Chapter 5 for each of the community capitals. This figure clearly shows variations among the 7 capitals. Built capital and Kibung scored low on the overall CRI and this indicates the difficulties encountered in accessing health facilities and in communities having any influence over health policy in the Bulolo District. This appears to reflect the lack of priority from the state and the developer, and the rugged terrain that creates difficulties for people in accessing these services.

### 6.4.2 Lihir: Mature operational mine

Lihir represents the mature operational stage of a mine. The Lihir Gold Mine had been in operation for almost two decades at the time of this research. In this stage the mine impacted villages should have had ample time to have their health services well established. Table 6.3 shows the perceptions of Lihirians of challenges they encounter in accessing health services in the different stages of mining.

**Table 6.3: Challenges of accessing health services, by stages of mining in Lihir.**

Stages of Mining				
Challenges	Memories on beginning of mining	Operational (now)	Future: After mine closure	Total
Non-availability of health services	7 (32%)	3 (14%)	12 (54%)	22
Non-availability of transport	8 (36)	2 (9%)	12 (55%)	22
Prefer the use of traditional methods	9 (41%)	6 (27%)	7 (32%)	22
Lack of finances	8 (36%)	3 (14%)	11 (50%)	22

Source: Fieldwork (2012).

Table 6.3 illustrates the general perception of interviewees in Lihir that the challenges they face in accessing finances, transport, and health services are significantly lower in the current stage of mining than previously. The results show that only 14% felt the challenge of accessing sufficient finances for health services were greatest now and just 9% felt problems with transport were most significant in the current stage. These results from Lihir indicate that most families believe they now have reasonable access to health services compared to past and post mine phase. Many now have access to transport and finances as a result of the mine development that enable them to access relevant services. The operations of Lihir Gold Mine resulted in enabling infrastructure

such as transport and an island ring road system that make it easier for families to access health services. However, many of the interviewees still anticipate challenges to the availability of services after mine closure. Results in Table 6.3 indicate that more than 50% of respondents anticipated that the challenges in accessing finances; transport and health services would be greatest after mine closure. Their reflections on the pre-mining situation underpin this concern, as a lack of finance and transport were seen by many as contributing factors to the health services being less accessible prior to the mine. This also confirms the findings of Church, Frost and Sullivan, (2000) that poor transport places limitations on surrounding access to services and social exclusion.

There are also a high number of families who still use traditional herbs and other approaches to heal illnesses. Responses from the survey showed that 27% of people believed that use of traditional approaches in healing was highest in the operational phase despite the greater availability of transport and biomedical health services. Many of these interviewees indicate that they use both, the formal and traditional healing approaches concurrently. This indicates that they see traditional healing approaches as still valuable despite the accessibility of biomedical health services. A study by Macintyre and others (2005) also indicates the resilience of traditional approaches to healing in Lihir.

The interviewees also believed that there may be a slight increase of 32% in the period after mine closure in the use of traditional methods, in part perhaps because they also

anticipate a lack of finances to access formal health system facilities. This indicates that some interviewees are fully aware of the challenges that mine closure will bring.

As for Figure 6.4, Figure 6.5 is based on the proxy indicators for the community capitals as developed in Chapter 5, and displays the strength of each of the community capitals in Lihir. The scores on all the capitals are consistently high (especially cultural and human) except for Kibung, and demonstrate a community with high levels of access to health and other services.

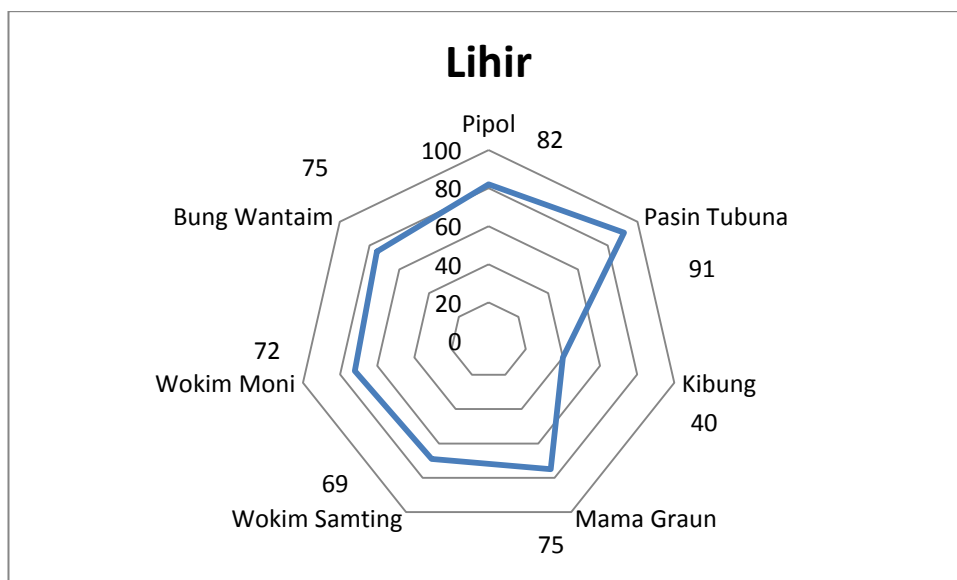


Figure 6.5: Overall interactions on community capitals in Lihir.

Source: Fieldwork (2012).

### 6.4.3 Misima: After mine closure

Misima represents the 'after mine closure' category as mining operations by Misima Mine Limited (MML) ended in 2005. At the time of this research, Misima was identified as a community that had been experiencing a decline in services such as power and water supply, and access to effective and efficient medical services compared to what they had experienced during the operational stages of mining. Table 6.4 shows

interviewees’ perception of the comparative challenges over the different stages of mines in terms of accessing health services, based on their recall of Pre-Mine and Operational conditions.

**Table 6.4: Challenges of accessing health services, by stages of mining in Misima.**

Challenges	Stages of Mining			Total
	Memories Beginning	During	Now (After closure)	
Non-availability of health services	4 (20%)	0	16 (80%)	20
Lack of finances	4 (20%)	0	16(80%)	20
Non-availability of transport	3 (15%)	1 (5%)	16 (80%)	20
Prefer to use traditional medicine	3 (15%)	2 (10%)	15 (75%)	20

Source: Fieldwork (2012).

Interviewees in Misima are faced with multiple challenges to accessing health services. Eighty percent of the interviewed families felt that the challenges of access to health services were greatest in the period since mine closure. Likewise an overwhelming 80% felt the challenges from lack of finances and transport were greatest in the post mine closure stage. Those who did not have finances to pay for transport could not access the available but limited health services. The evidence indirectly supports the argument made earlier that if there is insufficient cash flow, this also impacts the interviewees’ access to proper health services. The results further show that 75% of the interviewees were using traditional approaches to healing alongside biomedical services more now than in previous stages. Many of these community members indicated that they use both approaches to heal their illnesses when they are available. They use either of the services whenever they felt it was convenient to them, and when it is difficult to access the formal health services, they will increasingly go back to

traditional forms of healing. For example some would use herbs and simultaneously use biomedicines if available, to deal with the same illness (see Chapter 7). The results underline that people felt the multiple challenges encountered in Misima in the post-mining stage were greater than previous stages. A similar finding is supported by Byford (n.d), who confirms the hardships encountered on Misima in the period immediately after mine closure.

The interviewees’ memories of the other two stages of mining — i.e. beginning and during operations - clearly show that while they faced challenges to access health services before the mine, these were regarded as being lesser than they are now confronted with. The results in Table 6.4 illustrate that their perceptions of the problems they face after mine closure contrast poorly with the perceived experiences during mine operations when transport, money and health services were more readily available.

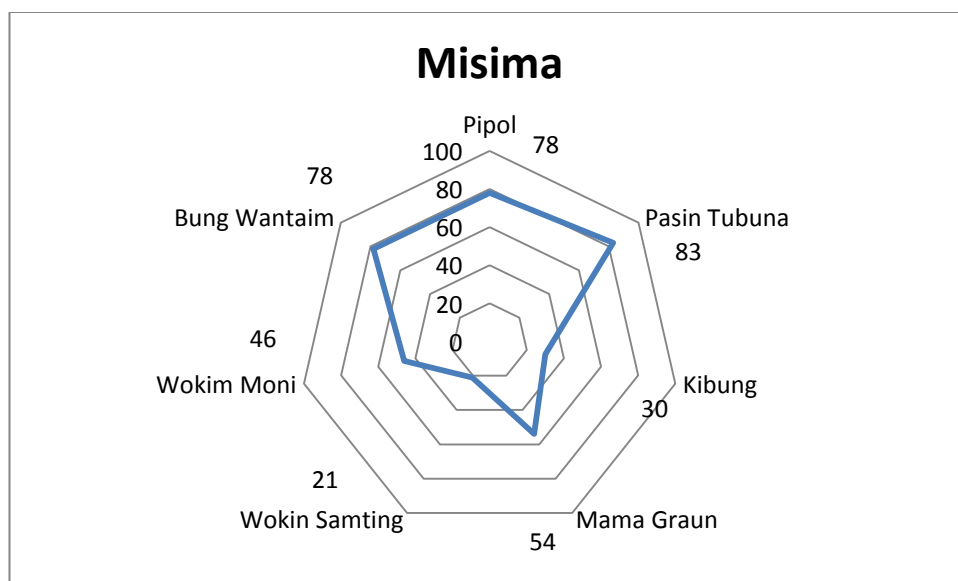


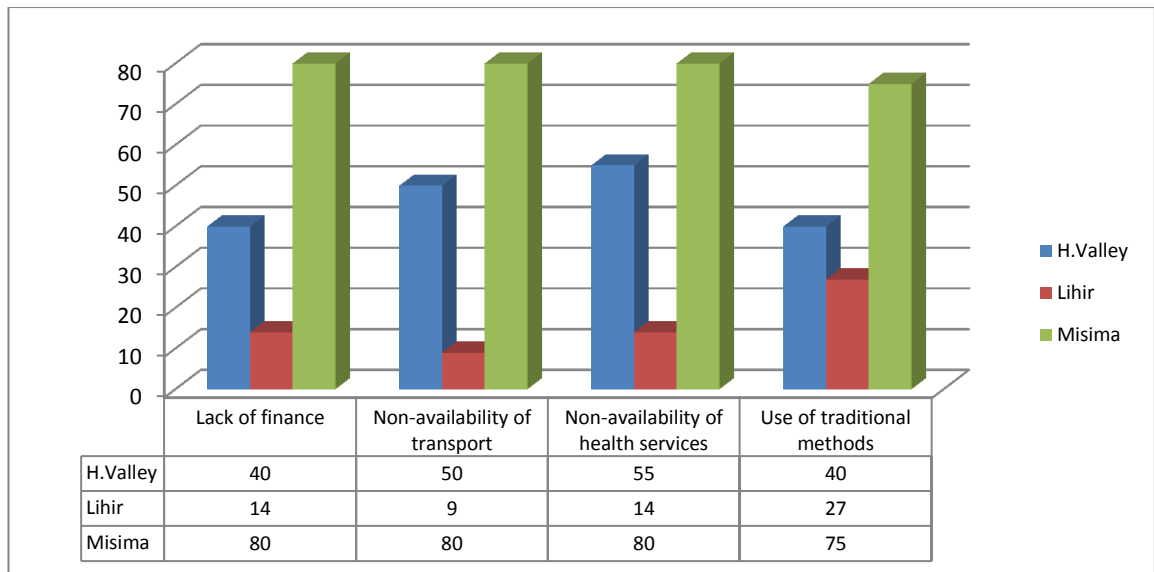
Figure 6.6: Overall interactions on community capitals in of Misima.

Figure 6.6 displays the relative strength of each community capital in Misima, based on the proxy indicators developed in Chapter 5. The levels of these proxy indicators of the community capitals in Misima show major differences among the capitals. Built capital scored the lowest, while Kibung, mama graun and wokim moni were also relatively low. This could imply the low priority of the stakeholders to synchronise the building of community resilience through the development of the community capitals, with priority put on some and not others of the capitals. The next section summarises the findings across the three communities.

#### **6.4.4 Summary**

The changes and challenges in the three mining impacted communities are many, but vary according to their stages in mining. These communities are confronted, at different stages, with numerous challenges, four of which are highlighted: lack of finances, non-availability of transport, non-availability of health services, and reliance on traditional healing methods. Figure 6.7 provides a summary of these challenges in accessing health services across the three communities in the current context.

### Building Community Resilience in Mine Impacted Communities



**Figure 6.7: Summary of challenges in accessing health services in the three communities at their current stage.**

Source: Fieldwork (2012).

The results from Lihir confirm that people in the operational stage feel that they encounter fewer challenges in comparison to the pre and post-mine phases. It is also clear that communities at Hidden Valley and Lihir anticipate that access to health services after mining will be more difficult than during the operational period. The results from Misima indicate the challenges of accessing health care are regarded by this community as the greatest now, even higher than for the early stage of mining.

The other issue that comes across clearly is the importance of the complementary use of both biomedicines and traditional approaches to healing. These traditional approaches include the use of herbs as well as spiritual aspects such as prayers influenced by customary values. Misima showed a high percentage (75 %) of its people using traditional medicine in the post mine stage, compared to earlier stages on Misima, and the current levels for the other two communities; Lihir (27%) and Hidden Valley (40%). Although the use of traditional healing pre-existed and continued to be



used in these communities, this current high percentage on Misima seems to be associated with the diminished lack of facilities and other enabling services, and infrastructure such as good roads and the availability of transport following mine closure. The results support the obvious assessment that the more difficulties the interviewees encounter in accessing biomedicines, the more they are inclined to use traditional approaches to heal their illnesses.

The results from Hidden Valley further demonstrate a significant proportion of people (80%) felt the difficulties accessing health services because of the cost of available transport were greatest now compared to what they anticipated in the future. The interviewees experienced hardships in accessing transport and a means of generating income. In Lihir the results reveal that few people felt the challenges accessing finances and transport were significant for them now compared to previously. People within the mine impacted villages appear to now have more access to relevant services like transport and health. Misima, eight years into the post mining stage, demonstrates clearly the decline in living standards and the impermanence or non-sustainability of the benefits made available during mining operations. Eighty per cent indicated that the challenge of lack of finances and transport to access health facilities was greatest in the current stage. The interviewees in the study confirm that the erosion of government support aggravates the level of difficulties they currently encounter, especially in relation to health service accessibility. There seems little activity by local, provincial or GoPNG to intervene in the decline of the infrastructure and services that are crucial to the communities. In an attempt to find solutions to some of the hardships the interviewees were also asked to express what they thought about health

and other support services such as road linkages and resources that could contribute to the building of resilience in their communities; and to sustain effective and efficient delivery of services in all stages of mining. The next section presents and discusses these interviewee perceptions of community capitals within the three communities.

## **6.5 Community assessment of the community capitals**

The Bilum Framework and its capitals approach provides a systematic way of understanding the ways in which community resilience can be affected by change. Literature has identified the strength of the various community capitals as being critical to building resilient communities (Magis, 2007, 2010; Mayunga, 2007; Ungar, 2011). The community capitals framework then becomes an important means for measuring the level of resilience in the three communities (2009; Magis, 2010) and, developed as the Bilum Framework, is used to explore the role and effects of the delivery of health services in building resilience in these communities. This subsection displays the results of the overall assessment by locals of the strengths of various capitals in their communities. It builds on the previous sections above, and integrates other responses regarding all seven of the community capitals. This then becomes the basis for the proxy indicators used in Chapter 8 to develop a Community Resilience Index (CRI). Table 6.5 presents the perceptions of the interviewees' at each mine site who were asked about aspects of the different community capitals. This provides a way of linking the capitals and hence an understanding of the interactions between them in the context of mine-impacted communities in PNG.

Table 6.5: Overall perceptions of Community Capitals, by Percentages.

Community Capitals	Mine Impacted Communities					
	Hidden Valley /20		Lihir /22		Misima /20	
	No.	%	No.	%	No.	%
<b>Wokim Moni</b>						
<i>Main Sources of income</i>						
Compensation/royalties/salary	2	10	8	36.4	7	35
Small income generating activities	11	55	12	55	5	25
Subsistence activities	7	35	2	9.1	8	40
<b>Bung Wantaim</b>						
<i>Networks</i>						
National	0	0	1	4.5	0	0
Provincial	1	5	1	4.5	0	0
Local	19	95	18	81.8	17	85
Other	0	0	2	9.1	3	15
<b>Kibung</b>						
<i>Decision making</i>						
National	0		0		0	0
Provincial	0	0	0		0	0
Local	14	70	17	77.3	15	75
Other	6	30	5	22.7	5	25
<b>Mama Graun</b>						
<i>Natural resources</i>						
Minerals	13	65	17	77.3	6	30
Geographical features (wild animals, forest)	3	15	1	4.5	2	10
Land/Water	4	20	4	18.2	12	60
<b>Pasin Tubuna</b>						
<i>Healing approaches</i>						
Use of herbs	2	10	3	13.6	5	25
Spiritual healing	3	15	2	9.1	2	10
Influence of customary values on health	3	15	1	4.5	2	10
Two or more of above approaches	12	60	15	68.2	10	50
Other	0	0	1	4.5	1	5
<b>Pipol</b>						
<i>Development of local population</i>						
Educational qualification ( Yr10+)	10	50	8	36.4	9	45
General training	0	0	1	4.5	3	15
Training on health issues	1	5	2	9.1	2	10
Two or more	9	45	11	50	6	30
<b>Wokim Samting</b>						
<i>Means of communication</i>						
Phones in Health facilities	6	30	9	40.9	7	35
Own (mobile phones)	12	60	10	45.5	11	55
Other	2	10	3	13.6	2	10

Source: Fieldwork (2012).

Community capitals, as understood in the context of the Bilum Framework, interact to produce tangible outcomes in terms of health. A brief discussion of each capital, what they say about health, and the respective percentages from each site follows.

Wokim Moni (Financial capital) refers to money sources and financial assets. The questions in the survey divided financial capital into three categories: (i) monetary income that comes directly from the mine or other stakeholders such as wages, compensation and royalties; (ii) small income generating activities (SMEs), and (iii) subsistence activities.

Wages are paid to those who are employed by government agencies, mining companies or other private companies and non-governmental organisations. This differed across the three communities; Misima and Hidden Valley appear to have more people employed by the government agencies, while in Lihir the majority of the respondents were employed by the mining company or engaged in contract work related to the mine. In Misima those previously employed at this mine are now mainly employed by Newcrest at the Lihir Mine. At the time of this research Air Niugini was on behalf of Newcrest flying Misima employees to and from Lihir. Those with formal employment then provide remittances to their families, and these are used to assist with accessing of health services. Other studies (Cai, 2003; Orozco, 2002) support the significance of remittances enabling access to services. Both Lihir and Misima had higher percentages of people receiving wages than Hidden Valley because a higher proportion of the interviewees received income from employment with the government, the mining company or other employers.

Compensation and royalties are paid to landowners, whose land is used for mining, and this is the case in Hidden Valley and Lihir where there is large scale mining. The compensation and royalty payments are not the key focus on this study, rather the focus is on the overall income of the selected communities as opposed to exploring the spread and effects of compensation and royalties. A significant amount of other work (see Ballard & Banks, 2003; Macintyre & Foale, 2007; Filer & Macintyre, 2006) shows that the compensation and royalty payments in the mining communities in PNG often produce few tangible long-term benefits. Thus, it is difficult to determine the contribution of compensation and royalty payments to the building of community resilience.

Small-Medium Enterprises (SMEs) are small income generating activities such as trade stores, private trucks, boats and other businesses that are used to generate funds that then be used to access services. Table 6.5 shows that interviewees from all the selected communities engaged in small scale businesses. In fact, Lihir and Hidden Valley had high levels at 55% of respondents. In Lihir most of the interviewees were involved in contracted projects such as building village houses. Results in Hidden Valley confirm the literature in chapter three because many interviewees were involved in small-scale mining activities that were carried out along the local Watut River were not related to large scale mining. Others were engaged in selling items in the local trade stores and markets. Misima with the lower proportion of 25% had the most respondents engaged in food sales and some small scale artisanal mining activities. Many of these income generating activities are initiated by the community members themselves.

Table 6.5 also shows that a percentage of interviewees continue to depend heavily on subsistence agriculture at all mine sites. Misima had the highest percentage (40%) of its interviewees indicating reliance on subsistence activities while at Hidden Valley and Lihir the figures were 35% and 9%, respectively. The interviewees in Misima indicated that they returned to subsistence agriculture after the mine closure, as there was no other revenue source available to them. In Hidden Valley and Misima, then, many people are reliant largely on subsistence agricultural activities such as farming (and fishing in the case of Misima). In Lihir, although there are more opportunities for employment, some interviewees still responded that they sustain themselves through gardening, fishing and hunting.

Many interviewees responded that despite the economic benefits of mining in the community they still face socioeconomic challenges. Mining benefits are also linked to other social and health issues such as an increase in alcohol consumption and related domestic violence, which then leads to strained family relationships such as marriage break-ups and lack of support for women and children. These results are also evident in other mine-impacted communities in PNG (Bonnell, 1999; Johnson, 2011).

Overall, up to 40% (see Table 6.5) of the interviewees across the three communities continue to rely on subsistence agriculture. These findings are supported by other work that highlights the importance of rural mining communities continuing to rely on subsistence agriculture (Garvin, McGee, Smoyer-Tomic & Aubynn, 2009; Stedman,

Parkins & Beckley, 2004). This contributes to the building of resilience in these communities.

Political capital concerns the involvement of the community members in the decision making process on issues that affect them. Table 6.5 shows that the interviewees' had little to no relationship with either the national and provincial government institutions. For the national government only Lihir had 4.5% of its interviewees responding positively regarding linkages or connections to this level while the Hidden Valley and Misima interviewees had none. For the provincial government agencies, Hidden Valley had 5% and 4.5% for Misima. These results imply that the national and provincial institutions do not have a close relationship with the people in the selected MICs.

In contrast to the national and provincial government agencies, the interviewees from Hidden Valley, Lihir and Misima in Table 6.5 scored their participation in local political processes to be much higher – 95%, 81.8% and 85%, respectively. The interviewees' interaction demonstrates a higher level of political participation with the local level government council and amongst themselves. The interviewees in the selected communities supported their local members in accessing relevant health services, however the most significant decisions on health services are made at the national and provincial levels of government. Local views on choices and on the relevance, availability and accessibility of health services are therefore not reflected in the allocation of resources. Other writers like Friedmann, (1992), Irvin and Stansbury (2004) on community participation regarding decision making highlight how community participation in decisions can make significance contributions to the

empowerment of the people at the community level and simultaneously build resilience. This does not appear to be the case in these mining impacted communities.

Cultural capital in this study is indicated through the use of traditional approaches to health. These approaches include the community members' use of herbs, spiritual healing and influence of customary values in seeking help for the sick. Table 6.5 shows that the three communities had high percentages of the interviewees continuously using two or more of approaches to heal illnesses. Lihir had the highest percentage at 68% followed by Hidden Valley (60%) and Misima (50%). Kipalan, et al. (2012) and Macintyre, et al. (2005) confirm that the use of traditional approaches to healing continues in PNG, alongside or in the absence of biomedical approaches. Decisions on the use of traditional medicine are based largely on an individual basis; they do not appear to involve the whole community. Some traditional healing practices are treated as sacred within the community. The decisions as to their use are not communal ones, but can be delegated to certain people in the community to exercise their healing practices for the common good (Lepowsky, 1990).

Natural capital refers to the natural environment and its resources including forests and minerals, and the physical features such as land and rivers. Table 6.5 provides the respondents' views on the resources, with minerals remaining as a source of income for the community and themselves through small-scale mining as presented in Chapter Three, but most had encountered difficulties in accessing land and drinking water because the mining had damaged, alienated or destroyed these natural resources. It shows that the interviewees are worst off in Lihir and Hidden Valley where just 20%



and 18.2% respectively, felt they still had access to sufficient land and water resources whereas prior to mining they had 100% access. On Misima this was not seen as such an issue, although there was on-going exploration for minerals during the time of this research which could again threaten these resources. Concerns raised in these communities appear to be similar in many ways, such as the pollution of water sources and the destruction of agricultural land. Other studies (Banks, 2002; Kitula, 2006; Martinez-Alier, 2001) confirm that large-scale mining operations can have a great impact on the natural environment (and hence access to resources) by causing river and land pollution.

Built capital refers to the road linkages, the transport system, and other enabling infrastructure (see section 6.4) including communication facilities such as telephone lines. This research used communications as a main indicator for built capital. Table 6.5 shows high percentages of 60%, 45.5% and 55%, respectively, in Hidden Valley, Lihir and Misima, who have access to their own mobile phone and hence can communicate to arrange for transport to get proper medical help. Cheong, (2007) also argues for the importance of the availability and accessibility of communication resources as vital in delivering health services. Franco, Bennett & Kanfer (2002) also note the importance of communications in contributing to the mobility of health personnel so that they effectively perform to their roles and responsibilities.

Overall, Table 6.5 demonstrates that the community capitals to support resilience for most interviewees were generally regarded as low, although it varies significantly across the three operations. This supports the earlier argument that the delivery of

appropriate and accessible health services, critical to building community resilience, is also low for the three communities, regardless of the stage of mining. This issue is returned to in Chapter 8.

## 6.6 Conclusion

This chapter has presented the findings from the survey questionnaire relating to the community experience of accessibility to health services and their assessment of the strength of the various community capitals. The interviewees in the three communities perceived weaknesses in all the capitals that challenged the effective and efficient delivery of health services in these communities. The main issue that emerged was the lack of resources and mobilisation towards the strengthening of the respective community capitals. The perceptions varied across the stages of mining, however, in all cases these resulted in ineffective and inefficient delivery of health services which in turn contributes to a weakness in community resilience. Families in the early and after mine closure stages appeared to encounter more challenges in accessing effective health services. It appears that targeting the strengthening of the community capitals, especially in the form of enabling infrastructure to facilitate more effective and efficient delivery of health services, is not a priority for the government or other stakeholders, an issue developed in depth in the following chapter. This in turn can present a challenge to building resilience and achieving sustainable development in these communities. The next chapter builds on these findings by presenting the results from the qualitative research methods and highlights the manner in which the policy

contexts at each mining community influences the delivery of health services, and by extension the contribution to community capitals and resilience.

## Chapter 7

# Policy and health service delivery in mining communities

*The goal of health care in PNG is “Strengthened Primary Health Care for All and Improved Service Delivery for the Rural Majority and Urban Disadvantaged” (NDoH, 2010, p.1)*

### 7.1 Introduction

This chapter focuses on the application of the policy framework for the delivery of health services in the selected communities, how this impact on the building of CR, and the challenges this process encounters. The chapter draws largely on the findings from the qualitative research methods of data collection used: document analysis, semi-structured interviews and purposive observation. Importantly, the material in this chapter complements the results from the survey questionnaire which were presented in Chapter 6. The findings from the semi-structured interviews here focus on the experiences of the interviewees regarding their community’s experience as located in the different stages of mining. The chapter provides details of the broader context and structures within which the community capitals of the Bilum Framework are strengthened or weakened by the effectiveness/ineffectiveness of health service delivery, and the ways in which this supports or detracts from the building of community resilience.

This chapter has four sections. Following this introduction, section 7.2 presents the relevant policies and identified key result areas (KRAs) from the NHP, along with the health-related aspects of the MoAs for the Hidden Valley, Lihir and Misima mine developments. Sections 7.3-7.5 present the findings from the three case studies. These sections analyse the experiences of the interviewees in relation to the delivery of health services around each of these mine operations, noting the different contributions of the stakeholders and the challenges experienced. Section 7.6 concludes this chapter by summarising the results and outlines the relationship of this chapter to the following discussion chapter.

## **7.2 The relevant policies – what are they?**

The National Constitution of the Independent State of PNG is the overarching framework from which all legislation including the Mining Act (1992), health policies and mining agreements are derived. As there are several policies that relate to the delivery of health services in the MICs it is important to define the role of each. The first is the NHP 2011-2020. The NHP is mandated by the National Health Administration Act 1997 (NDoH, 2010). The implementation of the NHP complements the Provincial Health Authorities Act 2007, the PNG Development Strategic Plan 2010-2030 (PNGDSP) and PNG Vision 2050 (Department of Prime Minister and National Executive Council, 2009)<sup>19</sup>. For the purpose of this study only four main policies are analysed, and the overarching vision and goals are listed in Table 7.1.

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<sup>19</sup> PNG Vision 2050 is the master plan of PNG from which other government policies are formulated. This vision directs development in the country.

**Table 7.1: The Vision and Goals (health related) of the four main policy documents.**

Policy	Vision/Goal
National Health Plan 2011-2020 (2010)	“Strengthened Primary Health Care for All and Improved Service Delivery for the Rural Majority and Urban Disadvantaged” ( <i>Ministry of Health, 2010, p.1</i> )
MoA Misima	Community Infrastructure and Social Services
MoA Relating to the Health Services on Lihir Island (1996)	To establish an integrated medical facility
MoA Hidden Valley	Family development programme

Source: Document analysis (2014).

The NHP is the central policy platform and has embedded within it the intent of the ‘Seven Pillars’<sup>20</sup> of the Vision 2050 - the most relevant of which is the third: institutional development and service delivery. To implement the NHP’s vision, eight different Key Results Areas (KRAs) are prioritised. Amongst these eight, KRAs 1, 2 and 3 are the overarching ones to which the others are related. These three KRAs are important to this study as they connect with the concept of building of CR through the delivery of effective and efficient health services. Table 7.2 presents the NHP’s three KRAs.

**Table 7.2: The NHP’s KRAs’ on ‘Institutional Development and Service Delivery’**

National Health Plan Key Result Areas	Aim
1	Improve service delivery
2	Strengthen partnerships and coordination with stakeholders
3	Strengthen health systems and governance

<sup>20</sup> The seven pillars of Vision 2050 are: (i) Human Capital Development, Gender, Youth and People Empowerment; (ii) Wealth Creation; (iii) Institutional Development and Service Delivery; (iv) Security and International Relations; (v) Environment Sustainability and Climate Change; (vi) Spiritual, Cultural and Community Development; and, (vii) Strategic Planning, Integration and Control.

Source: Adapted from National Department of Health (2010, p.6).

KRA 1 aims to improve health service delivery to the rural majority. The objectives for this KRA are to increase access to quality health services largely to those who experience problems in accessing these services. It further targets the rebuilding of primary health care infrastructure, and the placement of health personnel to meet the health needs of the people. In PNG, 85% of the people live in rural areas with limited access to infrastructure and hence experience difficulties in accessing health services along with other government functions (Thomason & Hancock, 2011; Thomason & Rodney, 2009; Connell, 1997; James, et al., 2012; Müller, et al., 1998).

KRA 2 focuses on the strengthening of partnerships and coordination among stakeholders with the aim of improving the effectiveness and efficiency of health service delivery. KRA 2 endeavours to extend the NDoH's network with private health providers, including extractive industries, churches and NGOs, into areas that lack access to the publicly provided health services, while the GoPNG maintains coordination and monitoring roles under the NHP. The NDoH's commitment to working in partnership with the extractive industries so as to deliver health services in the impacted communities has resulted in a range of partnerships with the extractive industries. These include partnerships with Oil Search and Esso Highlands Limited (EHL, now Exxon Mobil, PNG). For example, Oil Search deliver aeromedical retrieval in the Southern Highlands Province where they are located, using a helicopter to pick up emergency medical cases from within their communities (Kaptigau, 2012). These

partnerships are of benefit to the communities in providing services to people who are otherwise unable to access available provincial health services.

The NDoH also convenes forums to share experiences with its institutions and other stakeholders. In 2012, the NDoH in partnership with the extractive industries held the Annual Health Symposium themed 'Natural Resources Development and its Impact on PNG Health Services' (Medical Society of Papua New Guinea, 2012). The symposium was a part of the implementation of the NHP 2011-2020 relating to Public Private Partnerships (PPPs) with a specific emphasis on the extractive industries. It included partners from extractive industries, research and educational institutions, and hospitals. These PPPs, as noted by Thomason and Hancock (2011) are perceived as positive by those involved. Unfortunately the permanence of such partnerships is not guaranteed and so the KRA is not necessarily achieving a long-term solution to the plight of the rural population in accessing a full range of health services.

KRA 3 targets the "Strengthening of Health Systems and Governance" (NDoH, 2010, p.23). Under this KRA, the Ministry of Health has several objectives including: developing financial resources management; producing a well-prepared workforce; achieving efficient medical supply procurement and distribution services; improving health information systems and developing leadership; and improving governance at all management levels. The NHP targets the strengthening of existing health services through effective governance at all level of its management. Ascroft, Sweeney, Samei, Semos and Morgan (2011), in a study on the management of rural health systems in PNG, support the argument that the management of health systems in rural areas



needs strengthening. The following sections discuss the MoAs of the three communities in relation to the delivery of health services.

### **7.3 Case study one: Hidden Valley**

Morobe Mining Joint Venture (MMJV)-Hidden Valley Mine was established in 2005, and is located in the Bulolo district of Morobe Province, situated on the northeast of mainland PNG as shown in Figure 5.1. It is one of the three operations under MMJV; the other two are Wafi-Golpu Joint Venture and Morobe Exploration Joint Venture. Bulolo District has a total population of 77, 232 with 6 LLGS of which 5 are Rural and 1 Urban (NRI, 2010). The Rural LLGs consists of Mumeng, Waria, Watut, Wau and Buang while the only Urban LLG is Wau Bulolo. The Bulolo District has 4 health centres and 40 aid posts with health personnel of eleven nursing officers (NRI, 2010). This study has a specific focus on Watut and Wau Rural LLGs where the Hidden Valley Mine is located, although the medical facilities at nearby Wau Bulolo Urban LLG are also relevant.

Hidden Valley's plan for health is integrated into the MoA relating to the Hidden Valley Gold Project (2005). Health matters appear under various sub clauses in the MoA, including:

#### **25.1**

*The Wau/Bulolo Urban, Wau Rural and Watut Local Level Governments undertake to provide assistance to establish a Family Development programme in the mine affected areas to further advance the aims and aspirations of family life, women and youth through life skills training programmes, micro-credit programmes, and agriculture, health and literacy programmes (p.17).*

**28.1**

*Morobe Consolidated Gold (MCG) shall provide, during the mine construction period, and during mine life suitable funding as agreed upon during its annual budgeting cycle. The funding will be dependent on both impacts of mining and social responsibility as well as economic circumstances. Projects will include: education, training, health and agriculture extension programmes, alcohol and drug HIV/AIDS awareness and educational programmes, water tanks, and identified sustainable development programmes and projects (p.18).*

**30.1.**

*MCG will work with the LLG's to provide technical assistance to establish the Family Development Programme's (sic) for the mine affected areas to advance the aims and aspirations of families through life skills training programmes, micro credit programmes, agriculture, health and literacy programmes (pp.18-19).*

The Hidden Valley MoA approach to the delivery of health services is somewhat vague and largely generic. There is limited evidence of any detailed follow-up health plans. The MoA aims to enhance the overall wellbeing of families; advance the aims and aspirations of families; by running training programmes that cover agriculture, health and literacy. My fieldwork, including focus groups and interviews with health workers and community members, revealed that there is little evidence of improved health services for the Bulolo district as a whole. No company staff were able to be interviewed but documents from both company and government were analysed to examine what health services were being delivered by the MMJV to implement the MoA. These are discussed in the following section.

### **7.3.1 The GoPNG and health services**

The health services in Hidden Valley, Bulolo are delivered mainly by the GoPNG and include forty two aid posts, four health centres (NRI, 2010) — Bulolo health centre

during the time of this research was the District Hospital. Interviews demonstrated that MMJV contributes by building aid posts. Most of these facilities were established well before the current MMJV mining operations as mining has been occurring in Wau-Bulolo for almost a century (see Chapter 3). Aid posts within the Hidden Valley community are similar to those elsewhere in PNG with basic buildings with limited running water and/or power supply. Most of these buildings only have a shelf or cupboard for storage and a few chairs or forms for the patients to sit on. The services provided typically consist of the supply of basic drugs for common illnesses like malaria, fevers and headaches, and dressing of wounds. Patients with more complicated conditions are referred to the rural health centres and, if required, further up to the district hospital or the provincial hospital in Lae.

In general, the health care experience of people in the Wau-Bulolo area is reflective of health services that lack the resources to provide effective and efficient treatment or care. The following are the reflections of a health professional:

*Very pathetic, I think it's even worse than before (the mine). The first time I came I went to the hospital up there and there was virtually nothing. And to tell you the fact the hospital in itself is a risk— high risk and the people in here (Wau) live by God's grace. Mothers delivering and all the sick people. There is virtually nothing there to cater for the sick people. Wau Rural Hospital is not even a hospital. It's an aid post. There is no equipment so the hospital status should be degraded or down regulated to an aid post status or even close this hospital altogether. Basically, the services are non-existent (HWHV4, November, 2012).*

Semi-structured interviews revealed six main issues that encapsulated the informants' experiences when accessing the available health services: (i) lack of enabling infrastructure, (ii) lack of finances, (iii) limitations in networking and collaborating with

other stakeholders, (iv) lack of participation in decision making, (v) shortage of health workers, and (vi) lack of drugs. Table 7.3 presents the views from the health workers and interviewees on these issues, which are their experiences in the provision and receiving of health services.

**Table 7.3: Key Issues in accessing health services, Hidden Valley: Responses by interviewees and health workers.**

Issue	Health worker ( <i>Provider</i> )	Community member ( <i>Recipient</i> )
<b>Lack of enabling infrastructure</b>	We have no transport, our ambulance is not working. Sometimes when there is no transport, patients die. Some of these people die from preventable deaths. Some people walk for long distances to the hospital ( <i>HWHV2</i> ). If there is no car, they make bed (stretcher), put the sick on it and carry them to the health centre. If mothers have complications like retaining of the placenta or bleeding the families or community still carry them even through mountains, they still carry them. This has happened many times ( <i>HWHV3</i> ).	We have limited transport and the road condition makes it difficult for cars to travel. People walk long distances to get medical attention ( <i>CMHV1</i> )  We have an ambulance but the management is not so good. We find our own transport to take sick relatives to Lae. The health worker responsible for taking the sick person also comes with us. We pay both the health worker and the driver because we hire the truck ( <i>CMHV3</i> ).
<b>Lack of finances</b>	No money to pay for rations to feed the patients contributes to a lot of things ( <i>other problems</i> ). Many sick people do not want to come and stay in the hospital. Because if they come, what will they eat? How can their family carry food and walk long distances? Many prefer to take the medicines home. We are not sure if they take their doses. We see a lot of deaths. A lot of things are caused by funding. A lot of our activities are not carried out because of funding. For example health patrols on immunisation programmes (for children) to be done twelve times a year is done only twice or three times a year ( <i>HWHV1</i> ).	
<b>Limitations in networking and collaborating</b>	The ambulance is there but those in the management of the health centre do not cooperate with the	We use our own car as an ambulance because the hospital cannot help us. The hospital

	staff who work in the wards. The relationship to work together is not there. The ambulance is there, but they ask the guardians of the patients to pay before the vehicle can be released (HWHV3).	ambulance does not help (CMHV1).
<b>Lack of participation in decision making</b>	They (the management) do not involve us in decision making, we just work. They make decisions themselves, the inside of the wards have nothing. We struggle to save people's lives (HWHV1).	
<b>Shortage of health workers</b>	We are not many, our staff ceiling is down, and we need more staff. We have only one staff member in each section and many sick people. Health workers who died or transferred to other places are not replaced (HWHV2).	
<b>Lack of drugs</b>		See story in p1 of this thesis. This story presents the difficulties a family encountered when accessing health care.

Source: Fieldwork (2012).

### **Limited transport and road system**

Interviews highlighted that the limited transport and access to road systems prevent villagers from using the health services in the Bulolo district. One of the local informants in Table 7.3 notes the poor state of the road system that links most of the villages to these services, and the limited available roads are not maintained. Most people use bush tracks which are slow to walk on. People, despite being sick, have to walk these tracks to access health services. They often walked for several hours or more over rugged terrain to access these services. This resonates with the work of Gibson & Rozelle, (2003) and Müller, et al. (1998) who also highlight the lack of access to infrastructure for the majority of rural residents in PNG and record how this causes

severe difficulties for people in accessing basic social services such as health. These findings also reflect the literature presented in chapter 2 of this thesis.

***Lack of finances***

The quotes from key informants above show that the lack of finances is also a contributing factor to a range of problems including the difficulties in carrying out immunisation programmes for children, and providing food for the patients in all rural health centres and the District hospital. The sick have to provide food for themselves in hospital. A lack of finances also contributes to difficulties in accessing the limited available transport. Several of the informants — both community members and health professionals — indicated that there were many occasions when the sick did not get the necessary medical assistance due to insufficient funds to pay for transport. Lack of finances is noted as an issue by both the health service providers and the recipients. This confirms the earlier findings of Campos-Outcalt, Kewa & Thomason (1995) and Holmberg et al. (2014) who argue that the delivery of health services in rural parts of PNG is severely constrained by a lack of financial resources. These funding constraints hence contribute to the hardships people encounter in accessing health services and in turn this reduces the opportunities to strengthen human capital and resilience in these communities.

However, there is evidence of economic opportunities in the Wau-Bulolo district largely from formal employment within both the public and private sector. The mining company employs mainly local landowners for manual jobs such as driving, catering, cleaning, and construction work, following the local employment preference clauses in

the MoA. Bainton and Macintyre (2013a) confirm that the landowners seek and demand this priority in employment and contract work in the MoAs for the mining operations in PNG. The other means of income generating activities come from the small scale mining operations in the area. As noted in Chapter 3, many people within the Wau-Bulolo area are involved in small scale mining. Moretti (2006) illustrated that significant numbers of the people around Mt Kaindi, in Wau, engaged in small scale mining activities and that this generated significant cash and improvements in livelihoods. Crispin (2003) has also noted that small scale mining activities were encouraged by GoPNG to alleviate poverty in rural PNG, and this is most prevalent in the Wau-Bulolo area.

***Lack of coordination and collaboration***

Interviewees argued that there is lack of collaboration from both within the particular organisations who deliver health services and others outside these stakeholders. For example, the various organisations in the Hidden Valley area usually operate independent of each other in assisting with patient transport. Meanwhile the seriously ill who depend on transport within their respective ward or village to travel to the required health facility are often unable to access suitable transport. The management teams of the different health services and the community were also unable to produce evidence of networking and collaborating with each other in catering for effective health services that systematically offer appropriate levels of care for the communities (see also MMJV, 2013). The MMJV Hidden Valley through its Public Private Partnerships is meant to work in collaboration with other stakeholders including the JTA International, National and Provincial Divisions of Health (MMJV, 2013). As noted

in Chapter 2, collaboration in the delivery of health services is critical to their effectiveness (Keast, Mandell, Brown & Woolcock, 2004; Lasker, Weiss & Miller, 2001). Clearly it is more cost effective to deliver services when the different parties work in partnership. This lack of collaboration from the relevant parties undermines the achievement of the NDoH's KRAs, especially KRA 2, which emphasises the role of the partnerships with the private sector.

***Lack of participation in decision making***

The interviewees illustrated that there is lack of community participation in health service planning and delivery, including decisions over whether or not to assist the sick with transport, and instead these are largely influenced or made by the district health services' managers (as evidenced by the quote in Table 7.3). I found that requests from the subordinate frontline health workers for the use of ambulances were overlooked by those responsible. The nursing officers and the CHWs are the first point of contact for the sick but their views on patient referral are constantly undermined. In addition, patients were asked to pay for the ambulance service prior to the release of the vehicle. Lack of participation and consensus in decision making undermine both the first three NDoH KRAs and the Vision 2050 pillar regarding institutional development and service delivery, and in addition it clearly detracts from building strong, healthy, resilient communities.

***Shortage of health workers***

According to the key informants and documents reviewed on MMJV, the health facilities in the Wau-Bulolo area lack appropriate levels of staff to provide adequate



assistance to the population. At the hospital, the different sections including outpatients and the maternity sections had a very low staff to patient ratio- lower than recommended levels. There is only one staff placed in each of the sections; with more patients (Field notes, 2012). This is clearly demonstrated by MMJV (2013) that also provides some health programmes including Specialist Rural Visits and Maternal and Child Health in the impacted communities. This is further illustrated by MMJV that it brings

*specialist doctor services right to the rural majority to assist with better health services delivery for the unfortunate population living in the most remote parts of the mine impacted areas. This year we start with recruiting our own Dr Miila Gena, who is superintendent for the community health programme who then coordinated the visit of the following medical specialist in Paediatrics, Eye and Obstetric & Gynanocology. The specialist had great impact on the communities; the communities really appreciated the assistance by MMJV and opted for more of this to happen (MMJV, 2013, p.22).*

One example that highlighted the effects of the staff shortage occurred in the labour ward where the staff reported it could be complicated and dangerous for the mothers and babies when several mothers are delivering at the same time. In Bulolo District Hospital, the CHW in-charge of the labour ward expressed the pressure she experiences when two to three mothers deliver at the same time (Field notes, 2012). As a result, staff struggled to deal with the overwhelming workload they have.

### ***Lack of drugs***

Observations and interviews showed a lack of basic medicines across all the health facilities in Wau-Bulolo area. Although these facilities receive drug supplies from Angau

Provincial Hospital, these supplies are insufficient and cannot meet the needs of sick people. The challenge of insufficient drug supplies is a reflection of weakness in the health system (Gilson, Magomi & Mkangaa, 1995; Howes, et al., 2014), and undermines the ability of health facilities to deliver effective services. The lack of drugs in Hidden Valley health facilities is also a reflection of wider problems with the system as other parts of PNG experience similar issues (James, et al., 2012).

### 7.3.2 Morobe Mining Joint Venture (MMJV) and health services

The MMJV Hidden Valley mine has a policy to implement the MoA commitment to deliver health services in the impacted communities (MMJV, 2011). Table 7.4 compares the GoPNG national health goal and the MMJV Hidden Valley goal which is aimed largely at the landowner villages and those within close proximity of these villages. The goals on health services from both these stakeholders are presented below to examine the impact of MMJV and delivery of health services in the Bulolo District.

**Table 7.4: Comparison of national health goal and MMJV goal.**

National health goal	MMJV (Hidden Valley) goal
'Strengthened Primary Health Care for All and Improved Service Delivery for the Rural Majority and Urban Disadvantaged' ( <i>Ministry of Health, 2010, p.1</i> ).	'Strengthen Primary Health Care and Improve Health Services Delivery' ( <i>MMJV, 2011, p.27</i> ).

Sources: NDoH (2010); MMJV (2011).

Table 7.4 presents both the NDoH goal and the corporate view from MMJV. MMJV aims to work in partnership with the GoPNG by improving community health among the impacted communities (MMJV, 2013). With this aim MMJV has a multi-sectorial

health approach to assess the different disease patterns in the communities, and aims to carry out a situational analysis on factors such as lack of manpower that limit effective delivery of health services. The company's multi-sectorial approach also focuses on the empowerment of people and the promotion of the GoPNG's 'Healthy Islands'<sup>21</sup> policy. While MMJV have a goal to deliver health services, in reality its effect is not seen.

While the MMJV's goal is to implement the national health goal of strengthening primary health care and improving health services, it does not specifically focus on any of the communities affected by its mining operation. This limits the effective local implementation of the national health goal for PNG. Moreover, the MoA relating to the Hidden Valley Gold Project (2005) was formulated in a generic manner with a lack of reference to specific aspects of the delivery of social services such as health and law and order in Bulolo District. The MoA makes little reference to specific groups of people — affected landowners, for example — who could be the target for improved support for health services. This means the developer delivers services according to their own agenda or timetable with little consideration for local development priorities.

While the local community members' capacity is built to sustain the care component of health, there appears to be a lack of emphasis on establishing health infrastructure in these communities. Some community members are trained to provide basic health

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<sup>21</sup> Healthy Islands concept regards a national policy on health promotion which aims to develop health in a 'holistic approach, and its strong focus [is] on preventive measures, health promotion and health protection' (NDoH, 2003, p.1).

services such as attending to childbirths in the villages (MMJV, 2013). MMJV staff use support services provided by the company to provide health services and this can also create dependency which undermines the building of resilience in these communities. The mine also has specific health initiatives including Multi-Sectorial Health Patrols, Community Health Worker (CHW) Sponsorship Training, and Maternal and Child Health Programmes that are provided to the wider community (MMJV, 2012, 2013). These programmes are delivered in the local community and support the *NDoH's* Key Result Area (KRA) 1 which aims to strengthen primary health care and improve health service delivery. Views from community members within the affected were sought to explore their experiences on MMJV's contribution to health services in Hidden Valley.

**Table 7.5: Views by Health Workers and Community Members on MMJV.**

Health workers	Community members
MMJV assisted by supplying mattresses to this hospital. They came and took photographs of the hospital about two years ago but nothing came after that. The mining company is not helping us; it's only helping the landowners. Not much help has been given to the Bulolo health centre ( <i>HWHV2</i> ).	We work together with MMJV but not really. — they need our assistance we give it to them. We signed contract for them to build aid posts and MMJV will pay the staff for three years and GoPNG will take over after that ( <i>CMHV1</i> ).
Mining company came and painted Wau health centre without consulting us. They are painting rundown buildings ( <i>HWHV3</i> ).	Company ( <i>Newcrest Hidden Valley</i> ) does not realise ( <i>they do not</i> ) and try to help or fund the health services. At the moment the health services are still on the negative side so if you are sick, do not think that you will get proper treatment from the health centre. There are no proper facilities to treat you. In the communities too, all the health services are run down ( <i>CMHV2</i> ).

Source: Fieldwork (2012)

MMJV's contribution in the delivery of health services in the Bulolo district showed few tangible results according to informants (see Table 7.5). Many said the mining company did little to support the GoPNG health services in the district. The lack or

infrequency of practical health support seems to be a consequence of MMJV's very generic overall health goal which I now discuss below.

### **7.3.3 Other support services**

Delivery of health services also relies on a range of other supporting forms of infrastructure (power supply, communication, water supply, and banking facilities) that contribute towards the delivery of health services in the impacted communities. Each of these is briefly discussed below, based on purposive observations and semi-structured interviews to determine what limiting or enabling effects each had on the effectiveness and efficiency of health service delivery towards the building of resilience.

#### ***Power and water supply***

There is limited electricity supply to most of the health facilities in the rural villages in Bulolo district. The power supply by PNG Power is supplied only to the facilities within the urban areas. The GoPNG in partnership with the World Bank in its rural electrification workshop (Matakiviti, 2005) intended to supply power to most rural areas, but this is currently far from complete. This plan, when it is achieved will support the NHP 2011-2020 (NDoH, 2010) in terms of delivering effective health services to rural areas, but in the meantime the lack of electricity works against the intent of the NHP. A supply of electricity will enable effective and efficient delivery of health services in terms of better medicine storage and allowing the use of other medical equipment. It also improves the working environment for staff in remote areas. The two health facilities visited in Bulolo and Wau had quite different access to power and water supply. The Bulolo District Hospital had a good and reliable supply of

power and water from a nearby private sector source (PNG Forest Products), while Wau Hospital experienced difficulties in accessing power and water, as well as experiencing regular interruptions to these services.

There is no piped or potable water supply within the Hidden Valley landowner villages. People still rely on natural sources of water such as rivers or creeks. Those who can afford them use tanks to collect rain water for household chores. Observations made during visits to the landowner villages confirmed that the women and children were still using rivers for household chores such as laundry and bathing. It is not clear if people drank from the river, but from observations there were water tanks in some of the landowner villages which people use for drinking, and MMJV claim to be supporting the spread of this form of water supply (MMJV, 2013).

### ***Communication***

Communications within the health services in the Wau-Bulolo district appear to be very difficult. Telephone services are rarely accessible to the health personnel on duty to ensure that they can make contact with medical staff from other health facilities when they need to. In the absence of GoPNG provided telephone services, staff use personal mobiles to communicate important patient information, especially when dealing with referral cases or in emergencies. The health workers interviewed said that they use private mobile phones to communicate on official issues such as the organisation of transport for patient referrals. This can cause patient confidentiality issues.

### ***Banking facilities***

Banking facilities in Bulolo are provided by the Bank of South Pacific (BSP) and Westpac. These services do make a contribution to the development of the impacted communities by providing avenues through which local populations can better manage their financial affairs and hence contribute to the building of financial capital in this community. This in turn assists people to access the funds to pay for health services, which also supports the provision of these services in the longer-term.

### ***Summary***

There are few tangible results for the Hidden Valley communities as a result of the start of operations of the mine, especially in the delivery of health services. Based on the interview responses, while the Hidden Valley mine has a limited but clear, this is not being actioned. The mine has done little to improve the delivery of health services within its impacted communities. The health facilities in Bulolo district are currently mainly provided by the state with little company input and are not regarded by stakeholders as effective and efficient. These impacts on the health status of the communities, and in turn this limits the building of community resilience in the Hidden Valley communities.

## **7.4 Case study two: Lihir**

The Lihir mine is located on Niolam, the biggest of the islands in the Lihir Group of Islands, in the Namatanai district of New Ireland Province, PNG. It began operations in 1996 and is now operated by Newcrest, an Australian Mining Company. By world

standards it is a major gold producer, with production of close to 1million ounces of gold annually. Lihir has one health centre, one sub health centre and a hospital that is run by International SOS (ISOS). Lihir also has 15 aid posts, one for each of its LLG wards. Namatanai District has a total population of 64, 929 with 5 Rural LLGs consisting of Namatanai, Sentral Niu Ailan, Konoagil, Tanir and Nimamar with 89 wards. The district has eighteen health centres and 28 aid posts with a health workforce of forty nine nursing officers (NRI, 2010). This study focuses only on the Nimamar LLG where the Lihir Gold Mine is established.

The Lihir operation has an initial MoA negotiated originally prior to the start of the mine that stipulates the delivery of health services in the Lihir Group of Islands. In this study, Lihir is the only case where I was able to interview all three main stakeholders (state, community and company) as well as others providing health services, as the other two mine operations had one of the stakeholders missing.

#### **7.4.1 The Lihir Memorandum of Agreement**

Lihir has a MoA specifically relating to health, entitled “MOA relating to the Health Services on Lihir Island” (1996, p.i) (see also Appendix 8). This was signed by the GoPNG, New Ireland Interim Provincial government (NIIPG) (at the time of signing), and Nimamar Development Authority (NDA); Catholic Church Health Agency (CCHA); and Lihir Management Company (LMC) (1995), the mining company at that time. This agreement was part of the Integrated Benefit Package (IBP) which provided a framework for making the benefits of mining available to the community. This MoA stipulated that an “integrated Medical Facility to be built at Londolovit on Niolam in



the New Ireland Province to serve both, the mine employees and other residents of the Lihir Group of Islands” (MoA Relating to the Health Services on Lihir Island, 1996, p.1). This document also spelt out the responsibilities of each of the stakeholders regarding the operation of health facilities such as the aid posts and the health centres in the community (see Table 7.6).

**Table 7.6: Lihir Health Services, Stakeholder, by responsibilities.**

Stakeholder	Responsibility	Financial support
The GoPNG including NIIPG and NDA	Responsible for all government health facilities on Lihir	GoPNG
Catholic Church	Responsible for Palie Health Centre with a focus on Maternal Child Health Programme.	NIIPG
LMC (ISOS)	Build the medical facility ( <i>Lihir Medical Centre</i> ) Manage and staff the medical facility	Mining company GoPNG

Source: Developed from (MoA Relating to the Health Services on Lihir Island (1996, p.1).

The MoA required all stakeholders to work in partnership, with the developer to be “solely responsible for the administration and the ongoing maintenance of the Medical Facility” (MoA relating to the health services on Lihir Island, 1996, p. 4) with some financial assistance from the GoPNG towards its operation. The agreement also required the staff of LMC to carry out regular visits to other health facilities such as health centres and aid posts on the Lihir Group of Islands.

Following a review of the MoA in 2007, a fourth stakeholder, Jane Thomason and Associates Inc. (JTAI) was included to deliver health services in Lihir. JTAI was incorporated to the delivery of health services in Lihir after the establishment of the Lihir Sustainable Development Plan (LSDP), the renegotiated and revised IBP agreement between the Lihir Mining Area Landowner Association (LMALA), GoPNG,

and Lihir Gold Limited (LGL). The aim of the LSDP was to allow communities to attain “financial independence and self-reliance” (LGL, 2009, p.6). The agreements that flow from the LSDP factor in the vision of the ‘Lihir Destiny’ (Bainton 2008) which aims to have local control over the delivery of community development projects including health, education and other social programmes.

Health services in Lihir are thus provided mainly by the GoPNG, the Catholic Church, and the Mining Company through LMC. Table 7.7 presents views of different stakeholders regarding the key health issues on the islands.

**Table 7.7: Key health issues on Lihir, by stakeholder.**

Issue	GoPNG health worker (Provider)	Catholic health worker	Community members (Recipient)
<b>Access to transport and health services</b>	We do not have transport so cannot follow up on cases such as women with abnormal pap smear results. We work with the Community Relations’ Department of Newcrest; they help us with transport (LSHW1).	We have an ambulance but when it breaks down we get help from LMALA (LCHW1).	Transport and health facilities are easy for people to access. People walk for about 20 minutes to get to the aid posts (LCFG1).
<b>Staffing</b>	Lack of staff so we cannot do other things. We have set programmes that we run. The number of staff has not changed but the population has increased (LSHW1).	Lack of staff has been ongoing (LCHW1)	
<b>Financial issues</b>	Not everyone has the money to pay (LSHW2)	Some have no money, some run away because they cannot afford to pay. Some get treatment and pay later but some do not pay at all (LCHW1)	Results from Chapter 6 indicated that fewer people encounter financial problems (see Table 6.3).

Source: Fieldwork (2012).

### **7.4.2 The GoPNG and health services**

The GoPNG prior to mining had established health services such as aid posts and health centres in Lihir (Thomason & Hancock, 2011). In Lihir there were at least health facilities including a “health centre, sub health centre, and four village aid posts” (Bentley, 2011, p.22). At the time of this research Lihir had one GoPNG operated health centre and fifteen aid posts, one in each of its Local Level Government (LLG) wards. The GoPNG-run health centre on Masahet Island and the aid posts in the wards are mainly staffed by nursing officers and the CHWs. These services are both remedial (treating malaria cases) and preventative (Maternal and Child Health (MCH) in their approach. However, the GoPNG run health facilities face some challenges as shown in Table 7.7, even though other stakeholders support the facilities. Health workers still indicated obstacles such as a lack of transport to move patients, although this was not seen to be such a significant issue by community respondents.

### **7.4.3 The Catholic Church**

The Catholic Church established a health facility equivalent to a rural health centre at Palie (on the far side of the island from the mine and the LMC) well before the establishment of the mining operations and it was the referral health facility for Lihir prior to the mine (Bentley, 2011; Hermer, 2005). This health centre operated as the district health centre of the Lihir Islands Nimamar Local Level Government (LINLLG). It also ran both remedial and preventative programmes. The Catholic Church continues to be responsible for the overall management of the health centre. This facility is now

rundown but continues to deliver health services to the communities living further away from the LMC. Health sector interviewees suggested that there is limited evidence of the GoPNG's support for to this health centre.

#### 7.4.4 Lihir Medical Centre

The LMC was established under the 1996 MoA between the Mining Company, the GoPNG, the Catholic Church and the community, for the delivery of health services on Lihir Island. The LMC provides health services to the mine employees and the Lihirian population. It is funded by the mining company with some assistance from the GoPNG; ISOS is contracted by Newcrest, the mining company, to run the facility and deliver the health services.

The health workers at the LMC assist other health facilities to carry out programmes such as maternal and child health (Field Interviews, 2012). The LMC assists the other government and church health facilities, especially the aid posts and the Palie health centre with advice and materials<sup>22</sup>. This response illustrates the partnerships between different health facilities:

*It is easy for the people to access health services because the mine helped us by establishing an aid post in every ward. There is transport available for people to use (LSHW2).*

LMC also carries out other functions including the coordination of drug supplies, transport and specialist medical care for the whole island (in effect LMC is seen as the

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<sup>22</sup> When I have an emergency I call the doctor, the doctor gives me instructions over the phone and I treat the patient (LCHW1, October, 2012).

referral hospital). The LMC coordinates drug supplies from the national drug store and distributes them to all the health facilities on the island as per the 1996 MoA. This improved supply of drugs is beneficial to the Lihirians as their health facilities do not have to wait as long to receive medical supplies, comparative to other communities in PNG (Bentley, 2011; Campos-Outcalt, et al., 1995, p.109; Macintyre, 2014). The LMC also caters for referrals from the other health facilities both from within and outside of Lihir. Providing health care to patients coming from other centres is an extra task that is not part of the MoA as one LMC doctor explains:

*People come here not because we want them to come, but they look for better health care where they can be cared for. And we are not supposed to be receiving referrals from these areas because we are not a referral centre. They are supposed to be referred to Namatanai and then Kavieng because all these islands are under the Namatanai district. Namatanai district hospital is supposed to cater for these islands. And from Namatanai as the first referral post, the secondary referral centre would be Kavieng as the referral hospital for the province. We are carrying the burden of the government in this hospital. We are not supposed to but when patients come we cannot turn them away. It's a lot of work but what can you do when a sick person come. We cannot just send patients away, we have to do something (Doctor, Lihir, October, 2012).*

The LMC provides a level of service equivalent to referral hospitals in PNG as it serves people from other parts of the province and hence does more than what it was initially intended for.

#### **7.4.5 Jane Thomason and Associates (JTAI)**

JTAI signed an agreement with LMALA after the review of MoA in 2006. JTAI is a private company that is contracted by LMALA to implement the Lihir Islands

Community Health Plan (LICH), a rolling five year framework that aims to improve and sustain effective and efficient health services (Thomason, Mitchell & Brown, n.d) and achieve the GoPNG's minimum standards for health services in the districts (NDoH, 2001). The involvement of JTAI by the landowners was to promote their 'Lihir Destiny' as a broad local development plan. The LICH was funded by the Lihir Sustainable Development Plan (LSDP) (funded by revenue derived from the mine) to improve the quality of community health services (Thomason & Hancock, 2011). JTAI works in partnership with the other stakeholders, and its primary services are to provide training and workshops on disease prevention. However, the funding of the LSDP does raise questions regarding the sustainability of health care service delivery after mine closure as the LSDP is funded through annual grants from the mining operation.

There is also still the potential for duplication in the types of programmes provided by the different stakeholders if there is no effective collaboration in the planning process amongst the groups who are involved in service provision. There are conflicting views regarding the effectiveness of this collaboration with nurses attached to the LMC saying these programmes are well maintained throughout the mine impacted villages, as well as the surrounding areas, including outer islands within the Lihir Group of Islands. More complicated medical cases are referred to the ISOS-run LMC. Other health workers give a different view (see Table 7.7), demonstrating the difficulties surrounding effective and efficient delivery of these services. The GoPNG and Catholic Church health facilities encounter on-going staff shortages. Health workers indicate that staff shortage is a serious problem because the number of patients put a lot of pressure on the limited staff. Both the GoPNG and church health services do get some

assistance in terms of extra staff from time to time from the LMC and JTAI. Also both the mining company and LMALA assisted with transport for sick people and health patrol visits within Lihir (see Table 7.7). However, this assistance is often provided on a temporary basis and so does not have a permanent impact on the staff shortages at the health centres.

Despite a high level of monetary flows through connections with the mine (employment etc, see Chapter 3) financial difficulties were still encountered by people on Lihir using the health facilities. Health workers reported that people who had no money to pay for the health services were provided with treatment but asked to pay when they can afford. Some of these people paid later, but others never did. This result supports the literature (Chapter 2) which shows that lack of resources – especially financial - contributes to the challenges in accessing health services in PNG. Hence even in the context of a well-supported health service there are people in the mining communities, particularly more distant villages, who encounter difficulty in generating income to pay for basic services such as health.

#### **7.4.6 LGL and other support services**

The presence of the mining company (LGL) plays an important part in improving access to effective health services for people in Lihir. The infrastructure provided such as road links enhances the ease with which people can access health services. People interviewed highlighted the importance of supporting infrastructure in enabling them

to easily access services. On Lihir the supporting infrastructure (roads, power, water supplies) have been built as part of the implementation of the agreements in the IBP.

### ***Physical infrastructure***

Relevant projects in terms of physical infrastructure include housing, and power and water supply are carried out under the mining-company funded Village Development Scheme (VDS) across all fifteen wards in the Nimamar LLG. The mining company staff members consult with the LMALA, NLLG, Nimamar Special Purpose Authority (NSPA), and the local ward members before building this infrastructure. A Newcrest employee (NCL1) who dealt with the establishment of infrastructure development projects commented:

*We do liaise, do consultation with the ward members on the kind of infrastructure they would like to plan for in their community and it's all inbuilt into the LSDP. That's where all the plans are supposed to come through. At the moment things are not really working as they should be. I think part of the problem is because LLG (NLLG) and LMALA had been over the past five years fighting each other over LSDP funds, and not really concentrating on playing their role through NSPA, but we (Newcrest) have been pushing along.*

*Building a system and then just leaving it there without any governing system in place, we know it's going to breakdown. We are working with the ward member and VPC (Village Planning Committee) to come up with a governance system. There is a document being prepared but we have been doing things on ad hoc basis. Long term view is to actually involve the community and get some young people trained in plumbing. Get them involved in the system to get hands-on training.*

In addition, other projects such as the building of community health centres were awarded as contracts to landowner companies. My personal observations and talking to community members in a landowner village indicate that one community facility at



least was incomplete; and the funds for completion had already been released to a landowner company. This points to the lack of a framework to ensure that required services stipulated by the MoA are established. In other words, there is no evidence that the Agreements have clearly defined clauses which cover the monitoring and evaluation of agreed projects.

### ***Power supply***

PNG POWER, a subsidiary of the GoPNG power supplier, is absent in this mine impacted community. The main supplier of electricity within the communities is the mining company. It supplies power to the Lihir Medical Centre and a few other health services, such as the aid post at Putput village located within the vicinity of the mine itself. The mining company also supplies power to the resettled landowner villages including Putput and Kunaë, and was extending it to other non-landowner villages during the time of this research, as well as to businesses operating within the Lihir mining town. This power supply is generated by the mining company-operated geothermal energy plant. A company employee commented:

*But again, that's using company expertise. There's a reliance back on the company afterwards. If you don't have a strong local works department or technical arm so that the NSPA – theoretically the technical arm of the local government – this sort of work should fall into their camp. Unfortunate that they have not had the capacity over the years to be as effective as they could be. You've got basically a framework or a body in place that could be utilised; it is very under-utilised at this point in time (NCL2).*

This arrangement is beneficial only in the medium term (*over the 30 years of the mine's life*) and under present circumstances could not be sustained after mine closure, detracting from the building of community resilience.

Two health facilities, the Catholic Church run health centre(s), at Palie and Masahet health centre generate their own power supply (using solar or diesel generators) but power is only available during the day or for certain hours of the day. This interrupted the effective functioning of critical equipment within these health facilities, which led to detrimental impacts on patients.

#### ***Water supply***

The mining company established a water supply for the resettled landowner villages. The mining company has plans to extend the water supply to other villages. This water supply makes life easier for the local populations that have it, and also has broad community health benefits. It is an advantage for these landowner villages in comparison to many other non-mining communities in PNG who do not have access to such a service.

#### ***Access to roads, transport and health services***

Respondents on Lihir indicated that they had relatively good transport to access health services. Transport on Lihir is provided by a range of private entities, including the mining company, LMALA and individuals who run private bus services. The mining company and LMALA assists the health facilities with transport at times when their

ambulances break down. People who live some distance away from the health facilities used the local bus service to go to the health facilities. Every council ward in Lihir had an aid post, and most people only had to walk a maximum of 20 minutes to access this basic level of health facility. Respondents also felt it was easy for them to access transport to go for further treatment if referred to the health centres or LMC/ISOS medical centre. Having good access to transport and health facilities can contribute to a higher health status within the community, and this in turn contributes to the building of resilience on Lihir.

Transport for health extension work carried out by the GoPNG and LMC medical staff is funded for by the company. For example *'well-baby'* clinics carried out by the nurses from the Baby and Maternal unit are organised by the mine. I experienced one such visit when travelling with the ISOS Maternal and Child Health (MCH) medical team on a trip to Malie Island, funded by the company. The trip also highlighted the corporate support in other ways: when the engine of the boat I was on with the medical team stopped working, the mine's marine transport safety officer picked us up within 20 minutes of a phone call. In Lihir response to emergency calls is very effective in comparison to other contexts in PNG. Further evidence for this comes from news that the Lihir Emergency Response Team took out the award for the PNG Mines Emergency Response Challenge in 2012 (Newcrest Mining Limited, 2013).

The banking facilities in Lihir are established and operated by the BSP. This allows access for locals to a mechanism that provides for better management of cash and

savings and hence fosters the building of wokim moni which can consequently contribute to the strengthening of resilience.

The mining company under the MoA largely takes responsibility for other enabling infrastructure on the island including roads and transport, buildings, electricity and water supply. All of this infrastructure and these services make the health services more accessible for Lihirians. While this is a clear advantage for Lihirians, the question remains as to what will happen after mine closure. There appears to be no mine closure plan targeting the sustainability of particular services including power supply. In this context, the GoPNG through the Nimamar LLG should be playing an active role in planning for the maintenance and further development of the available health services after mine closure.

### ***Creating dependency***

The GoPNG and Church health facilities' reliance on the LMC for support can create a form of dependency. The effects of mining benefits on the mind-set of the people and the local mechanisms and processes can contribute to the creation of dependency (see Banks, 2015; Filer & Macintyre, 2006, p. 216), which is of significance in terms of community resilience. Dependency on mine-derived benefits can work to undermine the sustainability of individual and community benefits and developments, and hence weakens resilience in the longer-term. This reliance and dependency on mine-derived support can shape opinions and attitudes towards the benefits of mining and have effects on local livelihoods both now and the future, especially in terms of life after mine closure.

Employment opportunities from the mining company can also shape people's perceptions regarding education, income generation and sustainable livelihoods. Many young people appear to see employment opportunities in the mine as more important and so put an end to their education. This view is emphasised by my Focus Group on Education on Lihir where participants noted that young people who leave school after grade ten often seek employment from the mine and do not pursue for education outside of Lihir, despite there being scholarships available for the children of Lihir for further study. Focus group discussions (FG 1 Lihir) showed that many young people leave school at grade 10 and are employed by the mine doing manual jobs on short term or casual contracts. This view is confirmed by a key informant within the LSDP Education programme who demonstrated that:

*When young people leave Lihir High School (grade 10) or leaving Palie (Vocational School), they are absorbed by the mine, Newcrest. They can get a job there (in the mine) (LCK11).*

Therefore, it comes back to low aspirations in terms of building pipol (human capital) — why try at school when there is an easy access to a paid job regardless. This can heighten the dependence of the communities on the mining company and GoPNG to provide both employment as well as the technical expertise to sustain services such as geothermal power generation and the water supply for the delivery of health services in Lihir.

### **Summary**

In summary, there is an extensive and well managed set of health services delivered on Lihir by the GoPNG, the Catholic Church, and the mining company through ISOS and JTAI under contract to LMALA. These stakeholders work in partnership (in theory, but less so in practice) to deliver effective health services to the Lihirian community. In turn, Lihir is the one site where there is good evidence that the outcomes for communities of these services have been positive (Bentley, 2011). For example “average life expectancy within the Lihir Group is approximately 64 years, with females having a slightly higher life expectancy than males”(Bentley,2011, p.22). There is also, however, an increasing dependence on mine-derived incomes and services that threatens the sustainability of these services and hence community resilience post-mine, even if this is still many years off. The interviews with LGL medical staff indicated a lack of cooperation from the local authorities and the GoPNG in the building of local capacity that will be able to sustain services at current levels without the presence of the mine.

### **7.5 Case three: Misima**

Misima Island is located in the Louisiade Archipelago in the Samarai-Murua district of Milne Bay Province. Misima Mine Limited (MML) began operations in 1988, and closed in August, 2004 after fifteen years of operation. It is the first mine in PNG that went through a formal, planned set of procedures for closure (unlike Bougainville Copper Limited (BCL) that experienced a forced closure as a result of community violence). With the mine closure there was a significant drop in the level of services available,

which has consequently affected the wellbeing of the community on Misima. The Samarai-Murua District has a total population of 43,158 comprises of 4 Rural LLGs of which are: Bwanabwana, Luisiade, Yaleyemba and Murua. The district has 4 health centres and 42 aid posts with 1 medical officer and 29 nursing officers (NRI, 2010). This study focuses on the Luisiade LLG where the MML mine operated. At the time of this research the Luisiade LLG had the Misima District Hospital, 2 sub health centres and 5 aid posts.

This subsection, as for Hidden valley and Lihir, above, outlines the MoA and its sections that refer to the delivery of health services, and then details the experiences of the community members as the users of these services. The responses from the interviewed community members in most cases comparisons to be drawn between the experiences during and after mine closure, highlighting that there were significant differences between the operational stage of mining and the current post-closure situation. The findings on Misima are divided into two parts. The first again details the main issues that arose as factors that restricted access to health services in Misima, including (i) lack of staff and finances, (ii) difficulty in access to transport, (iii) and delays in drug supplies (all of which are similar to Hidden Valley) , and (iv) a range of other significant issues. The second part of the findings deals with issues around governance of mine closure, an issue that is specific to Misima.

### **7.5.1 The Misima Memorandum of Agreement**

The Misima MoA (1990) was signed by the tri partite partners: the National Government; Placer Dome, a Canadian Mining Company operating as Misima Mine Limited (MML); and the landowners (Filer, Jackson & Henton, 2000). The original MoA (see Appendix 9) did not include the Milne Bay Provincial Government as a signatory, but the provincial government was involved in negotiations around infrastructure development and other services for Misima (Filer, et al., 2000; Johnson, 2012). This additional physical infrastructure included the building of roads, classrooms, and health facilities such as aid posts in both the provincial capital, Alotau, and Bwagaoia, the district headquarters of the Samarai-Murua District. There was no specific element of the MoA related to the delivery of health services in Misima. There is also no evidence that the Misima MoA was linked to the National Health Policy in force at its time of establishment (mid-1980s) or throughout its operation.

### **7.5.2 The GoPNG and health services**

The GoPNG is the main provider of health services in Misima, although there was some presence from church groups including The United and Seventh Day Adventist churches that ran awareness on HIV/Aids and other diseases. The Catholic Church had just established an aid post on Misima at the time of this research. Prior to and during MML operations there were no Church run health facilities in Louisiade LLG, although various Church groups including the Seventh Day Adventists ran random health



programmes such as HIV/AIDS prevention. There were, though, church-run health facilities in the other LLGs within the Samarai-Murua District.

The Misima District hospital was built by the GoPNG prior to the start of mining operations in 1988 as an agreed element of the MoA. Patients who cannot be treated in the health centres and aid posts are brought to this hospital for further treatment. The Misima District Hospital runs both remedial and preventative health programmes such as MCH to achieve the NHP KRAs, as with all GoPNG facilities throughout PNG.

During mining, the company's medical personal were available to assist staff employed by the GoPNG. MML had a small medical facility within its operational site to cater for its employees and their families. Since almost 80% of the mine employees were locals (Filer et al., 2000), through this mechanism MML assisted in making health services accessible to those who worked in the mine, and also provided patients who lived away from the health facilities access to transport and medical personnel. Misima District hospital was fully staffed with a doctor and other health workers available to deliver professional health services. These services were well maintained, and the Health Extension Officer dealt with a range of complicated medical issues that would have otherwise been referred to a level 5 or 6 hospital outside Misima. As will be seen below, this high level of service no longer continues on Misima.

### 7.5.3 Main issues

Six issues in relation to the health services emerged from the analysis of data collected on Misima. Table 7.8 presents these issues with comments from the health workers and community interviewees.

**Table 7.8: Key Issues in health service delivery on Misima, by health workers and community members.**

Issue	Health worker	Community member
<b>Lack of staff</b>	<p>A few aid posts have closed down due to lack of manpower. People who have retired, retrenched, terminated they were not replaced (MHW1).</p> <p>After mine closure, we lost our medical officer, there was no replacement. (MHW2).</p>	
<b>Lack of finances</b>	<p>Transport costs, the PMVs (<i>Public Motor Vehicles</i>) will not allow sick people to come (to the hospital). When the mine was here it had an outpatient for employees' families. Transport was there (provided) for employees' families...these services were free (MHW2).</p>	<p>Lack of finances to pay for medicine and school fees. Funds for future generation have lack of evidence on supporting young people of Misima (MFG1).</p> <p>People especially the youth face financial problems (MFG2).</p>
<b>Road and transport issues</b>	<p>When the mine was here they (<i>the mine</i>) did the maintenance. The roads were better; we didn't have a lot of breakdowns. When the mine left, the roads became very bad and that affected our outreach programmes, patient referrals —.we could not get them in quickly. The roads are very bad, and this is an ongoing problem (MHW2).</p>	<p>It's difficult to access transport (MFG2).</p>
<b>Delay in drug supply</b>	<p>We got a lot of help from them (MML), we worked side by side. They supported us especially by bringing drugs in from Port Moresby. Drug supplies, you know we got our things on time. We are back to our usual way of having to wait for things (drugs) to come (MHW2).</p>	<p>There is a lack of drugs to deal with disease (malaria) outbreak (MFG1).</p>
<b>Sanitation issues</b>	<p>We have problem with water in the toilet, it's broken down. Water is not connected; it's not running to the aid post (MHW3).</p>	<p>There is no water supply to the villages because the system established by MML was vandalised by some community</p>

		<p>members (MFG1).</p> <p>There is difficulty in accessing safe drinking water (MFG2).</p>
<p><b>Communication and power supply</b></p>	<p>There was a time when communication was a big problem. Anyone who needed to call health workers outside of Misima used the District Hospital radio system. It became very difficult with patient management because some of the issues you can't discuss while all the other stations are listening (MHW2)</p>	<p>People use private mobile phones but have difficulties charging these phones because there is lack of electricity to charge the phones.</p>

Source: Fieldwork (2012).

The main issues revealed by the interviewees in Misima largely parallel the problems experienced in health service delivery at Hidden Valley, indicating initially that post-mining contexts appear to be similar to those prior to the beginning. These issues are now discussed in the context of the building of community resilience in post-mining contexts.

***Lack of staff***

As with the Hidden Valley situation, staff shortages were a key obstacle in running health facilities in Misima. This was largely a result of staff who were transferred, retrenched or who retired not being replaced. Health workers spoken to had a sense of being overworked. There was also concern expressed at the absence of qualified experts such as doctors, which has caused some difficulties in handling complicated cases. Staff available during the time of this research could not carry out surgery, for example. These findings reflect the issues revealed in the literature (see Section 2.4.2) that health facilities in PNG experience staff shortage which in turn can lead to serious health issues in the community. There was a clear decline in the level of health service

delivery in the post-mine period and this can have a negative influence in the building of resilience in Misima.

***Lack of finances***

A lack of finances also acted as an obstacle to accessing the available health services. There are now limited opportunities available for the people to generate income for themselves, with only a small number involved in cash cropping and small-scale alluvial mining. As a result, while health services in the aid posts in Misima are free, a common view amongst interviewees was that they lacked finances to pay for transport to easily access these health services. During the mining period people had access to free health services subsidised by the mine, along with more substantial levels of income. There were many economic opportunities available to community members during the mining period. The wages and other mine revenues such as royalties and compensation also enabled income generation for those who engaged in the informal sector through selling food stuffs in the local markets and similar activities. Women within the SML even had the resources to hire other non-landowner women to make gardens for them (Byford, n.d), and this provided further opportunities for women to generate income from surplus production.

***Transport and roads issues***

Two discrete but related contemporary issues on transport emerged from my interviews: first, people did not have easy access to transport, and second, the poor road conditions restricted health workers' community outreach programmes. Several

interviewees experienced problems in accessing transport to get medical care. The roads, now a government responsibility, have not been maintained after mine closure and this has led to their deterioration, often preventing vehicles from using the roads (see Table 7.8). During mining good roads had enabled the smooth operation of local transport services, improving the mobility of the local populations to access health services. This allowed for efficient private and mining company transportation, and assisted in making the health services more accessible to the local population. For those who had a family member employed by the mine, these services were free (See Table 7.8). In addition, people had easy access to transport options to bring their produce to markets. Many said that they did not have access to income generating activities so did not have money to pay for basic transport services after mine closure.

As one said:

*When the mine was here they were doing the maintenance because the workers were transported to and from work (many employees were locals who lived in the villages). We did not have a lot of breakdowns. When the mine left that (the bad road condition) affected our outreach programmes and couldn't get referred patients in quickly because the roads are very bad (MHW2).*

The common perception is that it was easier for them to access both transport and health services during the mining phase. This perception is also strongly supported by Byford (*n.d*) who also found that local people encountered difficulties in accessing services after mine closure.

***Delay in drug supply***

The health service workers interviewed noted that there were significant delays in drug supplies to Misima. Some comparisons are made between the current slow deliveries of drugs from the bulk store in Port Moresby to Misima, and the assistance received from the mining company during mining. Delays in drug supplies can cause adverse effects in patient wellbeing/health, and this issue is of concern to many in the community. As one said:

*We got a lot of help from them (MML). We worked side by side especially in the bringing of drugs from Port Moresby. Drug supplies- we got our things on time because it comes (came) directly from Port Moresby. These days our drugs often arrive late (MHW2).*

***Sanitation issues***

The health facilities in Misima faced difficulties in accessing clean water and sanitation. As one noted “indeed it’s not up to the standard that we want because the water is not connected, it’s not running through the aid post. We have only one tank and it is not enough” (MHW4). Several health workers especially the CHWs who run the aid posts noted that they often worked under poor conditions with a lack of sanitation facilities (see Table 7.8). As noted in chapter 2, having access to proper sanitation facilities is important to maintain adequate health services and control diseases.

Improved water supply and sanitation facilities in the Misima landowner villages were made available during mining under the MoA, particularly for the villages within the SML areas. These services were constructed and maintained by the mining company

throughout the mine operation. Landowner villages had access to running water during the mine life; however today, the water supply system has been vandalised and is no longer operating. As seen in figure 7.1, the ablution block that was used by the Narian villages is no longer in use.



**Figure 7.1: An abandoned ablution block in Narian Village, Misima.**

Source: Fieldwork (2012).

The lack of sanitation facilities in the aid posts and the villages directly affects the quality of available health services. This in turn impacts negatively on the overall health status of the community and building of community resilience. These results are supported by recent studies (Horwood & Greenhill, 2012; Horwood, et al., 2014) as presented in Chapter 2 on the spread of cholera in PNG. These studies highlighted how limited access to proper sanitation facilities restricted people from applying basic hygiene such as hand washing, and this contributed to the spread of diseases. The risks and potential for spread of diseases on Misima are similarly heightened by the lack of basic water and sanitation at the village level.

Banking services are another of the supporting infrastructures that assist in the delivery of health services. The PNG Banking Corporation (now BSP) was operating on Misima Island during the mining period, and these banks provided the opportunity for both the local populations and mining company to carry out transactions that facilitated flows of money, and the building of 'wokim moni' capital. At the time of this research, BSP services including ATMs were no longer available. Currently BSP customers have limited access to banking facilities in Misima, although mobile telephone banking is starting to become available.

The issues identified in Misima can be linked largely, in part, to the inefficiencies in the government system of PNG. While common to all sites studied, Misima was the only one without a mine at present, so the poor quality and limited extent of government was more obvious. The findings in Misima as illustrated in Table 7.8 confirm the literature in Chapters 2 and 3, with the decentralisation of powers from the national government to the provincial level and LLGs contributing to the difficulties people face in accessing health services, and from this, in building resilient communities.

#### **7.5.4 Governance: the other significant issue in Misima**

The limited presence and ineffective nature of the government system at the LLGs contributed to the challenges confronting the local communities in the Louisiade LLG of the Samarai-Murua District. Discussion with key informants provided insights into the issue of governance and mine closure in Misima.



The restoration of Misima started in 2009 after mine closure in 2004. The GoPNG released K20 million through the Works Department of the Milne Bay Provincial Government who further released the funds to the Samarai-Murua District Administration to administer the rehabilitation programme in line with 2003 National Budget for PNG (see The Department of Finance and Treasure, 2003). The rehabilitation of Misima targeted mainly the deterioration of the enabling infrastructure including health facilities, classrooms, roads, the wharf, hydro power supply, and the airport. In September 2012, at the time of this research, the rehabilitation programme on Misima had carried out maintenance on a number of these identified projects such as the sub-health center, roads, and Misima High School classrooms. The maintenance of these services can be seen as an effort towards the restoration of services in Misima following mine closure.

The project manager for this rehabilitation project commented on the challenges encountered in the process of restoring this community infrastructure after ten years of mine closure. It was regarded by the manager as too late:

*Hydro was handed over to Matahikan (a landowner company,) but went down due to financial problems. When the mine left, Misima went back to square one. Most technical people went out to work with other mining areas (mining companies), and Misima was left out. The machines have been there — they are too expensive to maintain so provincial government bought new machines, but they were the wrong ones. After the government gave K20 million, services are coming back, but not like it was during the mine, we are yet to meet that standard (Project Manager, Misima Rehabilitation Project, 2012).*

The comments from the project manager speak to a lack of governance at national, provincial and local levels, such that the lack of collaboration from stakeholders had

led to no maintenance on the power supply equipment and plant. This matches the pattern found in other parts of PNG under the decentralisation of health and other services in PNG discussed in earlier chapters.

The following comments from the Samarai-Murua District Administrator who took office after mine closure in 2005 also point to a lack of governance in the sense of planning for a post-mine future:

*The community, the people and the administration were so busy enjoying during that (those) 15 years. After 15 years, there is nothing left we start accusing each other; we go to court to contest legally. And association (Landowner association was) accusing the government that is (was) the actual happenings on Misima after mines (MML) left. When I arrived in 2005, I was taken to court for not providing essential services. And their (peoples') expectation(s) were very high because cash flow was here and goods and services are (were) so high because its (it was) a mining district. And now it (price of goods and services) never go down it continues to increase and this place will soon be declared with hardship.*

This also highlights a lack of effective coordination of the governance of processes surrounding the use of services such as the sharing of information on staff transfers, telephones to arrange patient transfer, and power supply that support the delivery of health services. These results parallel the situation in other parts of the country (see Chapters 2 and 3) that reveal the ways in which decentralisation negatively impacts on the delivery of health and other services in PNG (Campos-Outcalt et al, 1995; Feeny, 2013). Health workers identified, for example, problems with the reporting system on health management issues:

*When they are doing the transfer of staff, we have no power, nothing to say against it. For example, if we train somebody for a purpose in the district to do something, and the Catholics want to move their staff to another place, they just move him, and then they leave the place*

*(position) vacant. Not really vacant, but they put another person who is not trained. It gives us a hard time to train another person (MHW1).*

These results confirm the findings from the literature reviewed in Chapter 2 which highlighted challenges such as a lack of qualified staff, the diversion of funds and the unavailability of transport that prevented access to health services.

Communication between patients and service providers, and across different levels of the health service was problematic on Misima. There are limitations in accessing land telephone lines to contact health workers including nurses, Health Extension Officers (HEOs) in other health facilities. In part, this has seen a switch to the use of private mobile phones which are important as a tool for people who require medical attention, and for staff who need to communicate with other facilities regarding transfers to the next level of health outside of their community health facility. However, timely reporting of information to the District Health officer on health related activities such as the transfer of health workers by other stakeholders (the churches or NGOs) is typically not done as required.

Misima had a very reliable electricity supply to health facilities and individual homes during the mining era and this enabled the effective operation of other relevant services such as communication technology and health equipment. The period immediately after mine closure has been very difficult because the continuous power cuts destroyed the hospital communication system (see Table 7.8). The MML handed over the management of power supply to the locally-owned MTSA but conflicts among the landowners has resulted in lack of coordination which has a negative impact on the

supply of electricity. A lack of communication in contexts such as this can have negative consequences when uncertainties surrounding patient information put a person's life at risk (Klingner & Moscovice, 2012). The handling of communication in dealing with patient transfer is pivotal when it concerns a life and death situation, and the poor systems in place at Misima post-mining weaken service delivery significantly. The lack of effective forms of governance in the coordination of services such as telephones, power supply and staff transfers, then, do contribute to the difficulties experienced by people in accessing health services. This detracts from the building of resilience in Misima.

#### **7.5.5 Land and decision-making in the post-closure period in Misima**

The issue of landownership on Misima in the post-closure context also emerged as a significant concern in relation to decision-making, benefit sharing, and kinship relationships.

My research results are in line with previous work (see Byford n.d.), that showed there are significant community grievances regarding the role and status of the Landowners' Association and the implementation of the original MoA. A discussion with the Misima Towohu Landowner Association (MTSA) executives showed that the Misima MoA was not reviewed after its original formulation (MFG3), and they believe that this has led to various other challenges including the lack of transport faced by the communities. They indicated that there is a lack of any real sense of partnership among the relevant stakeholders. The MTSA executives stated that they were not involved in decision

making at the two critical stages of mine life: the beginning and the end. One informant (MFG1) explained that prior to the construction of the mine, there was a lack of involvement of landowners in the negotiations on the distribution of the benefits of mining.

In part, this is due to the ways in which decisions on landownership during the initial negotiations overlooked some landowners who believe they are the rightful landowners of the former SML. A study by Byford (n.d) confirms that the GoPNG's failure to rigorously identify all those who are recognised as the correct landowners had resulted in many landowner disputes. This process was bound to generate conflict, for as in many parts of Melanesia with similar diverse communal landownership systems "land serves as a convenient discursive point of reference to ties to locality and kin" (Ballard & Banks, 2003, p.299). One mining landowner expressed the views that the MoA negotiations and mine development process was fundamentally flawed:

*There wasn't any proper feasibility study made to identify the principal landowners? This has created 125-plus land disputes, the highest in the country. These issues (landowner conflicts) were created by the government itself. Had they (GoPNG) done proper feasibility studies there wouldn't be any land disputes (Landowner, Misima, September, 2012).*

This informant's definition of 'proper studies', appears to refer to the social mapping studies done during the initial negotiations with the landowners before the signing the MoA. This informant believes that original discussions and studies did not include some landowners. The development forum for Misima was held after the mine had been established (Filer, 2008). Although the concept of the development forum that is now held before the formulation of a MoA was not in place at the time of the

establishment of MML, a social impact study for a proposed goldmine in Misima was carried out by Rolf Gerritsen and Martha Macintyre (Gerritsen & Macintyre, 1986, 1991). These findings reflect the complications associated with landownership in a Melanesian mining context as presented in Chapter Three. The challenges of landownership as outlined in Chapter Three that include complex land histories and uncertain physical boundaries with no written records (Jorgensen, 1997) certainly applied in this instance.

Women on Misima further argue that they were excluded from any of the negotiations on mining-related benefit sharing. Two women leaders commented on how the consequences of those decisions made by male landowners continue to affect them:

*Women did not have any say in whatever the development is. Men jumping up and down, women always at the back (Former president of the Misima-Towohu Women's Association, Misima, September, 2012).*

*They (men) won't listen to women. We need more training on behaviour change. Like in a meeting, men make decisions. Women make gardens but when it comes to income (money) such as royalty, men are in control (President Misima- Towohu Women's Association, Misima, September, 2012).*

Misima is a matrilineal society where rights to land are passed down through women, and in this sense their male relatives are simply custodians of the land, rather than the only ones who can make decisions concerning their land.

The current president of the MTWA points to the exclusion of women from the decision making process, despite their strong association with the land. She believes that women in Misima are seen by some men in their community as contributing more

to gardening and other subsistence activities, rather than in entrepreneurial activities and decision making around the benefits of mining. This matches the writings of Byford (2003, n.d.) who clearly demonstrates that there was limited evidence of women's participation and their rights being respected in decision-making process on Misima.

Interviewees also stated that there was lack of local landowner consultation and involvement in decision making on mine closure. The interviewees involved in the two focus groups held on Misima (MFG1 & FMG3) gave accounts of the events surrounding mine closure that indicated that they were never consulted by the other stakeholders' (GoPNG and company) or even their own community leaders in terms of contributing to planning for mine closure. The people felt that mine closure plans were imposed on them. Jackson (2002) and Filer (2008) confirm that the experiences of people on Misima in the mine closure process anticipated the challenges they now face in terms of lack of income, limited accessibility to water and power supply, and even an increase in law and order problems in the area. MML in 2002 developed a Misima Mine Closure plan with the objective "to leave behind a better future", (Placer Dome Asia Pacific, 2002, p.1) for Misima Island. The planning of mine closure included consultations with the local community and the government representatives from the district, province and national-level departments. The plan recommended that the GoPNG should incorporate the Mine Closure plan (referred to as a Sustainability Plan) into its planning plans across all three levels of government. However, there is little evidence that any of these levels of government took this on board, and this contradicts the intent of the Sustainability Plan developed by MML. The interviewed

youth on Misima (focus groups MFG2 and MFG4) highlighted what they perceived as the inequalities in benefit sharing with a particular reference to their future. As one said:

*The problems we face in here is that not a lot of the parents who were working at that time (during mining) would invest (invested) for the people (their children) of today. There was no employment (opportunities) left behind (MY1).*

The youth admitted that, at times, they turn to anti-social behaviour such as excessive alcohol consumption and violence to release their frustrations. The Misima Future Generation's Fund, established as part of the Development Forum package to receive revenue from mine royalties was subsequently invested to provide for Misiman children's education, but the release of funds has been put on hold as a result of mismanagement. As one said " We are having problems with the management-managing of the funds (Future Generation Trust Funds) so Treasury (The Department of Treasury) is holding onto the money until the auditors from the Auditor General audit the records. This problem has been going on for 17 years" (Landowner). Byford (n.d.) in a study for Community Aid Abroad, confirms that anti-social behaviour, including alcohol abuse and domestic violence, were present in Misima at the time of mine closure. This behaviour from the youth strained relationships among the family members, and in turn can be seen to undermine social capital and hence the building of resilience in the community.



### **7.5.6 Resource curse and dependency**

Fieldwork on Misima revealed a limited level of accessibility to services such as transport and power supply. MML had been the main source of these and other essential services during the mine operational period. It made available many of the essential and enabling services including power supply, highly qualified medical personnel, a good road system, regular income and effective banking services. The community in this situation became overly dependent on the developer, and this has clearly had a negative effect on community resilience now that the mine has gone.

Socially, Misimans today are faced with a number of difficulties that impact on their livelihoods. The costs of the goods and services have increased (Byford, n.d). People struggle to afford basic services such as health and education. Misima has gone back to being one of the peripheral areas in the country, and like other peripheral areas it now lacks proper health-enabling infrastructure which in turn impedes the effective and efficient delivery of health services. Facilities such as power supply and running water are not as effective as during the period when the mine was operating (Byford, n.d). These changes and deficiencies were noted by Byford as early as 2003, so it seems that community life and resilience have not improved in the post-mine stage, and in fact have deteriorated further since then.

## **7.6 Conclusion**

The results and analysis in this chapter began with a review of the respective MoAs from Hidden Valley, Lihir, and Misima and found they were not well integrated with

the NDoH's NHP. The MoAs are full of good intentions, but they appear to stand alone. Four key aspects of these policies and agreements surfaced: mining companies predominantly establish infrastructure rather than deliver services; MoAs typically exclude meaningful landowner input into their desired health service outcomes; there is a lack of research to establish community priorities; and commitment appears to be lacking to provide the planning, resources and capacity needed to effectively deliver an integrated health service to the mine-affected communities. The results highlighted the ways in which the building of resilience in the MICs is dependent on, and also contributes to, the sustained effectiveness and efficiency in the delivery of health services.

The state needs to ensure that MoA for mining communities are an integral part of the broader planning process. Amongst other stakeholders, the landowners and the wider community must be able to make meaningful contributions to the formulation of the MoA. The community's input must be from research that shows the needs of the respective communities. The state in its capacity as the regulator of mining in the country should ensure that the establishment of any contribution by the developer must be in line with the aim of building resilience to achieve sustainable communities. This will assist in planning how the clauses in the MoA can contribute to the building of CCs in a manner where capitals are given priority in line with the needs of the community which, in the long run will integrate infrastructure and other development initiatives from the mining companies.

Consequently, three major challenges to the sustained and effective delivery of health services in these mine-impacted communities were revealed: a lack of collaboration

between the relevant stakeholders, a lack of synchronised policy initiatives, and a lack of integrated delivery of services according to the policies. These are picked up further in the following chapter. In turn, these challenges are also shaped by the effectiveness and efficiency of the governance of health and other services.

Except for Lihir the references to health in the MoAs are largely generic, and categorise the delivery of health services under a heading of community infrastructure and social services. The MoAs for Hidden Valley and Misima do not provide guidance on the relationship with the NDoH, and do not specifically mention building aspects of what can be considered community capitals. Neither the NHP 2011-2020 nor the MoAs elaborate on issues around the implementation of these policies and there is no emphasis or mention of the need to sustain a high level of health services during mining and after mine closure. The next chapter discusses the finding of chapters 6 and 7 in the context of the material presented in chapters 2, 3 & 4. The Bilum Framework will be used to tie together the findings from these previous chapters in terms of community capitals and resilience. It also discusses the implications of this analysis for policy development to strengthen resilience.

## Chapter 8

### Discussion: Building or undermining resilience?

#### 8.1 Introduction

This chapter draws together the discussion of three main themes that underpin this thesis: (i) the lack of policy alignment between the different actors in terms of health service delivery, (ii) the lack of access to health services in mine-affected communities, and, (iii) the fluctuating levels of community resilience across stages of mining that have been highlighted by this study. The chapter discusses how these issues impact on the building of resilience in mine-affected communities and explores how the interconnectedness that underpins the Bilum Framework can provide new ways of approaching the building of resilience for these communities. Based on the proxy indicators with reference to the seven community capitals presented in Chapter 4 as part of the Bilum Framework, a Community Resilience Index (CRI) is constructed to map the changing levels of the capitals over a mine's life. From this, a series of policy recommendations flow.

Access to health services is influenced by a range of connected factors, including institutional policy alignment, infrastructure, finances, education and available resources. Across most of Papua New Guinea many of these factors are weak, if not absent. The negative attitude of people can disrupt effective delivery of health services. For example, the abduction of two doctors from Modilon Hospital in Madang

resulted in “disruption to the provision of health services to the Madang public” (Post-Courier, June 12, 2015, p.2). This demonstrates the negligent mind-set of these kidnappers as to the importance of health workers and other community members who contribute positively to community development to enhance the building and maintenance of resilience. The effects of the establishment, operation and eventual closure of a mine on factors such as education and the community capitals are shaped by two broad sets of forces: first, while the mine is operating the additional resources that a mine can bring for individuals and the health service delivery agencies, typically enhance access to quality health services. Countering this, though, during the operational period the communities can also lose access to natural resources (mama graun) and social bonding (bung wantaim) due to the presence of a mine. Second, mine closure brings a different set of pressures, with the loss of many of the facilities and resources that a community may enjoy over the life of an operating mine, but potentially it may result in the strengthening of social capital and some residual legacy effects (higher levels of human capital — pipol — for example). Together these forces affect the holistic ‘weave’ of the community capitals in the Melanesian context, potentially weakening or strengthening different parts of the ‘Bilum’. This in turn means community resilience — the ability of communities to respond and adapt after disturbance through learning and collaboration with all relevant stakeholders, and strategic planning at local and national levels to maintain, measure, and strengthen community capitals — is going to alter and, as illustrated below, does not follow a simple linear path from stronger to weaker through time.

Following this introduction, this chapter contains six other sections. Section 8.2 discusses the issue of policy alignment, and the impact of this on the delivery of health services and the building of community resilience. Section 8.3 discusses the difficulties experienced in accessing health services, and the factors which contribute to this. Section 8.4 presents the levels of the various community capitals and explains their significance in building resilience in these mine-impacted communities. Section 8.5 focusses on the ways in which the results indicate fluctuating levels of resilience with reference to the different stages of mining in Hidden Valley, Lihir and Misima. Section 8.6 ties the different preceding sections together by exploring how the application of the Bilum Framework can produce specific targeted aspects of health service delivery for attention by policy makers, and section 8.7 is the conclusion of this chapter.

## **8.2 Policy issues**

Policy development is central in the context of the social world. It is what shapes the interactions between those with the resources and a mandate to use them for particular purposes, and those without, but in need of them. In complex situations such as around large-scale mining operations, there can be several actors with policy on particular issues, and frameworks that determine how decisions are made, that may not always align. The policies most relevant to this thesis (as presented in chapter 7) are the government's NHP (NDoH, 2010) and the MoAs with each mine impacted community which direct the respective mining companies' community development plans for the delivery of health services. This study identified three main issues with the policy environment around the mines: (1) the lack of alignment in the NHP and the MoAs, (2)

the lack of specificity in the MoAs' goals, and (3) inconsistencies in the formulation of MoAs.

### **8.2.1 Lack of policy alignment**

A lack of policy alignment among the various stakeholders concerned with the delivery of health services in the MICs was evident, as detailed in Chapter 7. This represents a central weakness in terms of the potential contribution of mining to access to health and hence to build or maintain any resilience. For example, the NHP (NDoH, 2010.p.19) does not specifically refer to the need to ensure alignment of MoAs or BSAs with the NHP in its KRA 2 on “Strengthening Partnerships and Coordination with Stakeholders”. On the same note, none of the MoAs detailed above make reference to the NHP. The example of the Lihir integrated benefit-sharing agreement, which has the greatest specific details on health, only focused on the establishment of the LMC. It does not include other health services and enabling infrastructure to allow people to more easily access health services such as better roads, although the link road was part of the broader, non-health related infrastructure package (see Appendix 8). The lack of policy alignment among the stakeholders in community development around the mine sites aligns with the work of Thomason and Hancock (2011) whose study on the extractive sector’s ability to deliver better health outcomes in PNG highlighted the virtual absence of collaboration between the parties.

The previous chapter noted the lack of alignment between state policy (the 2010 NHP) and the MoAs for each of the respective mining operations. The NHP (2010)

emphasises improvements in service delivery as its KRA 1, but does not seek to integrate these activities with other stakeholders' health services delivery plans. There is the acknowledgement of an aspiration to work in partnership with the extractive industries within its aim to promote public-private partnership (PPP), but this does not appear to include a focus on local-level service delivery improvements. Other policies like the Integrated Community Development policy (Department for Community Development, 2007) and the Corporate Plan 2009-2012 for the Ministry of Works (Department of Works, n.d) also do not seek to align with local health planning that aim to strengthen communities in a holistic manner. The Integrated Community Development policy focuses on four priority areas of "community learning, community governance, community economics and community environment" (Department for Community Development, 2007, p.10). This means there is lack of policy alignment to effectively connect the different policies that cover health and the building of roads. For example, the Ministry of Works Corporate Plan for transport focuses only on infrastructure development, although it does note effective relationships as one of its goals within its vision to "provide and maintain a priority road network that will contribute to a holistic quality of life that can be embraced and enjoyed by the people of PNG with access to opportunities available in a modern global village" (Department of Works, n.d, p. 5). In this context, then, there is little effort made by the state to integrate corporate initiatives in the health sector with its broader plans. As a result, as the literature on CSR and community development in mine-affected communities in PNG (Banks, Kuir-Ayius, Kombako & Sagir, 2013; Gilberthorpe & Banks, 2012), and elsewhere (Luning, 2012; Slack, 2012) confirms, the health (and other) initiatives of mining companies typically are designed and operated on an ad hoc basis,



disconnected from government service delivery, and seem to serve to mainly win community approval for their operations. Quinonez and Lavoie (2009) confirm similar findings in their study of Aboriginal groups in Canada in regard to the amalgamated approach adopted there which has not led to integrated policy for the delivery of health services. As a result, communities then miss out on effective and efficient delivery of accessible and affordable health services. This in turn accentuates the challenges that are experienced by communities affected by mining and combine with other factors that impact on the delivery of these services that undermine community resilience. One of these factors is the lack of clear and systematic focus on specific community health objectives in the MoAs.

### **8.2.2 Unsynchronised Memorandum of Agreements**

This study uncovered that the MoAs from the three case study sites differed in their goals for community development. The goals set in the MoAs for health services for Hidden Valley and Misima (see Section 7.3.2 & Appendix 9) are very broad and general. Both MoAs (as compared in Table 7.2) are non-specific and not targeted in terms of the objectives that they want to achieve. The lack of direction in planning the development of health services in the communities by the local stakeholders can lead the mining companies to design and promote their own particular vision and interests in the host communities. In this regard, the mining companies enter into health-related CSR initiatives in some instances to win favour from the communities and secure a social licence to operate (Owen & Kemp, 2013; Prno & Slocombe, 2012) so as to continue to pursue their business interests (Luning, 2012). This was the case in

Misima when Placer Dome used their own sustainability framework, a corporate model developed internationally, to plan for activities for after mine closure (Jackson, 2002). This study has shown that a close examination of the MoA for Misima and its longer-term impact on the communities' health and other support services paints a negative picture. Results in Chapters 6 and 7 clearly demonstrate the challenges encountered by the people: poor access to limited, even sometimes non-existent services. These findings are supported by Byford's (n.d) work that showed the communities on Misima were confronted with more challenges in their access to services in the stage after mine closure than existed previously.

MML and the GoPNG, in consultation with local community members, had planned to 'leave behind a better future' for the Misima community (MML, 2002). The MML mine Closure Plan (MML, 2002) was titled: 'Leaving Behind A Better Future' and sought to achieve a situation where the community could continue to have access to better health, education and housing. On the contrary, though, Misima is now confronted with more socio-economic problems and service delivery issues than prior to mining, including a lack of health services and income generating activities (see Section 7.5.3). The plan to leave a better future did not manifest itself.

Hidden Valley's clauses in the MoA (as noted above) are also broad with no clear goals for improving integrated service delivery including in health. Newcrest, through MMJV, has its own general plans on the delivery of health services (see Table 7.1) and is implementing aspects of them around the surrounding communities. This is again, though, the developer working to its own plans, largely to fulfil its community

obligations under its own CSR policies. The current challenges faced by the Hidden Valley local villages in terms of accessing effective health services cannot be blamed only on the developer, though, as the GoPNG is primarily responsible for creating most of the difficulties experienced by the communities due to its lack of service delivery in these areas to begin with (see Chapter 2).

Among the three case study communities only Lihir has a MoA that has specific plans for the development and delivery of health services within the Lihir Group of Islands (see Appendix 8). The Lihir MoA spells out that health services are to be provided jointly by the GoPNG, New Ireland Provincial Government, Nimamar Development Authority, the Catholic Church Health Agency and the Mining Company. The MoA also states the responsibilities of each of these stakeholders over the mine life but is less clear on what happens after the SML expires and the mine ceases. This does raise questions regarding the sustainability of the health services after mine closure.

### **8.2.3 Impact of policy inconsistencies on health services**

The case studies as discussed in Chapter 7 (see Table 7.4) reveal little evidence of effective collaboration between and liaison among the relevant stakeholders in terms of the alignment of plans for the delivery of services, such as health. A master development plan for the District that captures and incorporates the individual plans from each of the relevant stakeholders or the identification of their roles and responsibilities is lacking. Vision 2050 (The GoPNG, 2010), PNG National Strategic Development Plan 2011 - 2030, (GoPNG, 2010), and NHP (NDoH, 2010) all make

reference to working in partnership, but the way in which this is to be done — in the context of mining development MoAs for example — is not clear. It can be difficult to align plans in the impacted communities in PNG due to the varying characteristics of land owning communities and their expectations in terms of benefit arrangements (Imbun, 2013) coupled with the weak governance evident at local levels. From this analysis, it is obvious that the lack of policy alignment from the relevant stakeholders creates challenges for communities including poor access to services, and poor quality infrastructure such as a lack of sanitation in the health facilities. The non-alignment of policies from the relevant stakeholders has a profound negative impact on the delivery of health and other services. This clearly impacts on the building of resilience in these communities.

Lack of policy alignment and weak coordination in terms of implementation both contribute to difficulties experienced by the people seeking to access health services. These are issues that are deep-rooted into the system of service delivery in Papua New Guinea not only in health but other support services that contribute to the development and overall well-being of a community. Like the knitted fibres of a Bilum all these issues interconnect and one factor cannot operate effectively without the other. When one thread breaks, it weakens the whole. The section to follow summarises various factors which contribute to difficulties in accessing health services.

## **8.3 Difficulties in access to health services: some contributing factors**

Analysis from this study demonstrates that lack of access to basic health services was a difficulty encountered in all three communities although the extent of these difficulties varied (see Tables 6.2, 6.3 & 6.4). Three of the major difficulties evident are the hardships in accessing health services due to a lack of finance, limited transport, and a lack of other supporting infrastructure. These points are now expanded upon.

### **8.3.1 Lack of funds to access health services**

A lack of funds is a significant obstacle to households that contributes to the difficulties of many community members in accessing health services. The funding issue operates at two levels in the context of this study, as it is an issue for both the GoPNG (see Chapter 2) in terms of providing quality local health services, and the communities (see Chapter 6) in terms of getting to and being able to afford the services themselves. This is not confined to mining communities in PNG literature (Gibson & Rozelle, 2003; Pincock, 2006) highlighting patient problems in attending health facilities that are linked to the lack of funds, especially in the context of decentralisation (see Section 2.4).

The lack of funding in the government system to support health services results in a lack of resources to run these services. District hospitals lack funds to purchase medical equipment and supplies, or even food rations for patients (see Chapter 7). This

latter issue itself can lead to the worsening of people's health as a healthy diet contributes to the recovery of the sick.

At the community and household level, the findings of this study are paralleled by the findings from Sweeney and Mulou, (2012), and Gifford and Kestler, (2008) on health provision in rural areas. Sweeney and Mulou's (2012) work, for example, on the payment of health services in PNG revealed that health service fees prevented many people attending health facilities. This situation is encountered in Misima and Hidden Valley which clearly demonstrate that financial constraints to accessing health care are particularly acute in the early stages of mining, reflecting the poor conditions evident across rural Papua New Guinea (see James, et al., 2012; NRI, 2010; Pincock, 2006), and after mine closure, when the situation again starts to parallel other parts of the country. It is only during mining operations (as in Lihir now) that people have access to cash, and this stage is marked by both massive cash flows to many households, and the entrenchment of dependency of people on mining company health support. Lack of finances in the delivery of health services on a practical level leads to other challenges for people, such as having limited access to transport.

### **8.3.2 Lack of transport**

Lack of transport to access health services (see Figure 6.4) is common especially in the beginning and after mine closure stages, reflecting financing and resources at household and institutional levels. This again is tied in to the emphasis that is given to health service delivery during the operational stage of mining; while during the other

two stages communities receive less attention from the GoPNG and mining developers. These results are consistent with the findings of Byford (n.d) on Misima after the mine closure. More broadly, they also reflect the findings of Muller, et al, (1998) and Noor, et al, (2006) who confirm in their studies on distance between health facilities and villages in PNG that many people must walk long distances to the nearest health facility. In some instances the family or community end up carrying the sick on home-made stretchers to the nearest health facility. A case study on the realities of childbirth in rural PNG in the 2014 National Human Development Report for PNG (see Banks, et al., 2014, p.44) provides a graphic illustration of the tragic consequences of this. The limitations on the accessibility to health services reflect a range of factors, including health facilities that are situated at a distance from communities, and a mismatch between the health services and enabling infrastructure with for example, roads and other infrastructure such as bridges not linking communities to health facilities. The Misima and Hidden Valley communities both have some health facilities located some distance away from the impacted villages. In my view, these findings reflect that there is limited collaboration and poor coordination between stakeholders: the governance of the sector is weak, especially in terms of utilizing appropriate resources to deliver effective and efficient health services to the affected communities.

### **8.3.3 Lack of other support services**

Delivery of health services depends on a wide range of complementary infrastructure and services. In the case studies in Chapters 6 and 7 many of these were lacking in two

of the three cases (Hidden Valley and Misima). These include the lack of reliable power and water supply, communication facilities and banking facilities. Both water and power supplies are essential requirements in health facilities, as lighting, basic hygiene and the upkeep of health equipment are requirements for the delivery of effective services. Again, these are common issues across PNG: Haley's (2008) study on accessibility to basic health services (in Kopiago district in Hela Province in PNG) found that there was no power supply to the sub health centre that catered for a population of around 35,000. This had negative impacts on storage of drugs that require certain temperatures, as well as sterilising equipment. This situation is replicated in Hidden Valley, Misima and some of the smaller facilities on Lihir, illustrating that a large scale mine does not deal with the chronic health service delivery problems of rural PNG.

The issues discussed above that contribute to the difficulties encountered in the impacted communities (lack of finances; limited access to transport; and the lack of other support and infrastructure services in the delivery of health services) detract from the building of community resilience in these communities. From this analysis, one can conclude that these issues erode the core essence of building resilience in the impacted communities. The next section uses the Bilum Framework community capitals approach to link health with changing levels of resilience in each of the mine-impacted communities.



## 8.4 Levels of resilience: community capitals and stages of mining

One way to summarise the effects of the levels of access to health services on community resilience is to go back to the community capitals and their proxy indicators introduced earlier (Chapter 5 and 6). These provide a demonstration of the strength of each of the community capitals which can be compared across each of the impacted communities with their mines at different stages. The section seeks to explicitly tie the above discussion of the delivery of health services to these proxy indicators and the contribution of these services to the building of resilience in these communities. The measures of resilience based on each of the indicators are derived from the fieldwork and the design of the study introduced in Chapter 5 (see Section 5.7). Table 8.1 summarises again the proxy indicators used for each of the community capitals, and Table 8.2 presents the proxy indicators, expressed as percentages and averages as introduced earlier.

**Table 8.1: Summary of the Proxy Indicators.**

Community Capital	Proxy Indicators
<b>Pipol (<i>Human Capital</i>)</b> What are your acquired qualifications and training skills?	1. Qualification of people
	Percentage with Year 10 certificate and above
	2. Training undertaken by people
	Percentage who have attended formal training
	Proxy Indicator Score ( <i>Average of these</i> )
<b>Bung Wantaim (<i>Social Capital</i>)</b> Community involvement in activities What type of activities are you involved in?	1. Organised activities
	Percentage involved in two or more forms of community activities
	2. Informal community engagements
	Percentage involved in two or more activities
	Proxy Indicator Score ( <i>Average</i> )

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<b>Wokim Moni (<i>Financial Capital</i>)</b> Are you formally employed? What are the other alternatives you engage in to generate income?	1. Employment
	Percentage formally employed
	2. Small scale businesses ( <i>SMEs-e.g. small scale mining, trade stores, market sales</i> )
	Percentage generating some sort of income
Proxy Indicator Score ( <i>Average</i> )	
<b>Wokim Samting (<i>Built Capital</i>)</b> What are the main infrastructure and support services you have in the communities ( <i>roads linking villages and health services, water and sewerage systems, power supply etc.</i> )?  How do you get to the health facilities?	1. Access to support services in the delivery of health services
	Percent with access to roads, sanitation and power supply
	2. Available means of transport
	Percentage with access to two or means of transport ( <i>other than walking</i> )
Proxy Indicator Score ( <i>Average</i> )	
<b>Mama Graun (<i>Natural Capital</i>)</b> What are some natural resources you have access to?	1. Safe drinking water sources
	Percentage with access to two or more
	2. Access to land and resources for
	Percentage with access to land for gardening and minerals for small-scale mining
Proxy Indicator Score ( <i>Average</i> )	
<b>Kibung (<i>Political Capital</i>)</b> Community connections to power structure. Which level of power structure can you connect more to and hence shape decisions? What forms of community groups or institutions are people involved in ( <i>Women's groups, church groups</i> )?	1. Formal
	Percentage with access to two or more levels of policy and decision making
	2. Informal
	Percentage involved in two or more community groups
Proxy Indicator Score ( <i>Average</i> )	
<b>Pasin Tubuna (<i>Cultural Capital</i>)</b> What traditional or indigenous approaches do you use to heal sick people?	1. The use of herbs and other practices in healing ( <i>i.e. physical healing</i> )
	Percentage using both herbs and other traditional substances
	2. Influence of customary values on healing ( <i>beliefs on illnesses</i> )
	Percentage employing two or more forms of customary belief systems to treat illness
Proxy Indicator Score ( <i>Average</i> )	

Source: Fieldwork data (2012).

The averages and percentages of each of the capitals are presented in Table 8.2 and illuminate each proxy indicator's contribution to resilience. The levels for each are discussed below.

Table 8.2: The level of community resilience, by averages and percentages.

The Bilum Community Capitals		Total number by responses in MICs					
		Hidden Valley (Beginning stage)		Lihir (Established stage)		Misima (After mine closure)	
Community Capitals	Proxy Indicators	/35	Average %	/36	Average %	/38	Average %
Pipol (Human Capital) What are your acquired qualifications and training skills?	1. Qualification of people						
	Year 10 certificate and above	30	0.86	31	0.86	31	0.82
	b. None	5		5		7	
	2. Training undertaken by people						
	a. Formal training	30	0.86	23	0.78	24	0.73
	b. No training	5		13		14	
	Proxy Indicator Score (Average)		0.86		0.82		0.77
Bung Wantaim (Social Capital) What type of activities are you involved in?	Community involvement in activities						
	1. Organised activities						
	a. Involved in less than two activities	15		8		8	
	b. Two or more activities	20	0.57	27	0.75	30	0.79
	2. Informal community engagements	10		9		9	
	a. Involved in less than two activities						
	b. Two or more activities	25	0.71	27	0.75	29	0.76
	Proxy Indicator Score (Average)		0.64		0.75		0.77
Wokim Moni (Financial capital) Are you formally employed? What are the other alternatives you engage in to generate income?	1. Employment						
	a. Employed	25	0.71	22	0.61	8	0.21
	b. Not formally employed	10		14		30	
	2. Small scale businesses (SMEs- e.g. small scale mining, trade stores, market sales)						
	a. Generating some sort of income	25	0.71	30	0.83	26	0.68
	b. None	10		6		12	
	Proxy Indicator Score (Average)		0.71		0.72		0.45
Wokim Samting (Built Capital) What are the main support services you have in the communities?	1. Access to support services in the delivery of health services						
	a. roads linking villages and health services	18		2		25	
	b. water and sewer systems	5		1		4	
	c. power supply	7		8		2	
	d. access to all 3	5	0.14	25	0.69	7	0.21
	2. Available means of transport						
	a. ambulance	4		3		2	
	b. PMV truck/bus	7		3		8	

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How do you get to the health facilities?	c. two or more	9	0.26	25	0.69	8	0.21
	d. none ( <i>walking</i> )	15		5		20	
	Proxy Indicator Score ( <i>Average</i> )		0.20		0.69		0.21
Mama Graun ( <i>Natural Capital</i> ) What are some natural resources you have access to?	1.Safe drinking water sources						
	a. River	1					
	b. Rain water from tanks	2		4		1	
	c. Creek	7		2		4	
	d. Two or more	25	0.71	30	0.83	33	0.87
	2.Access to land and resources for						
	a. Gardening, fishing, hunting etc.	7		4		20	
	b. Minerals ( <i>ASM</i> )	2		7		10	
	C. Both of the above	27	0.77	25	0.69	8	0.21
Proxy Indicator Score ( <i>Average</i> )		0.74		0.76		0.54	
Kibung ( <i>Political Capital</i> ) Which level of power structure did you connect more and make decisions?	Community connections to power structure						
	1.Formal						
	a. Community involvement in policy making at national level						
	b. Community involvement in decision making at the provincial level	1				1	
	c. Local Level Government ( <i>through the ward councillor</i> )	32		34		35	
	d. Two or more	2	0.06	2	0.06	2	0.05
	2.Informal						
	a. Women Groups	1				2	
	b. Church groups	1		2		1	
	c. Youth groups			1		1	
	d. Two or more	33	0.94	33	0.92	34	0.89
	Proxy Indicator Score ( <i>Average</i> )		0.50		0.49		0.47
Pasin Tubuna ( <i>Cultural Capital</i> ) What traditional or indigenous approach do you use to heal sick people?	1.The use of herbs and other practices in healing ( <i>i.e. physical healing</i> )						
	Herbs only	2		3		5	
	Other traditional substances	3		1		2	
	Both	30	0.86	32	0.89	31	0.82
	2.Influence of customary values on healing ( <i>beliefs on illnesses</i> )						
	a. Customary beliefs	3		1		3	
	b. Spiritual beliefs	2		2		2	
	c. Values on certain foods				1		
	d. Two or more	30	0.86	33	0.92	32	0.84
Proxy Indicator Score ( <i>Average</i> )		0.86		0.90		0.83	

Source: Fieldwork data (2012).

The proxy indicators and averages presented in Table 8.2 illuminate levels of resilience across the seven community capitals that bind the Bilum Framework for each community. Each of the community capitals are discussed in the following sections.

## **8.5 Fluctuating levels of resilience and mining at different stages**

The levels of resilience clearly vary across the different stages of mining (early, operational and post-closure), and depend in large part on the community capitals and their connectedness and interactions at different stages in building resilience in each of the three communities. The levels of resilience shown by the proxy indicators in Table 8.2 were developed by applying the method outlined in Chapter 5. This subsection specifically addresses these proxy indicators in relation to the first Research Question which sought to explore the link between capitals and community resilience in the context of the delivery of health services in these communities. The most significant of the proxy indicators for each of the capitals are discussed in relation to how they simultaneously reflect, and also contribute to, the delivery of health and other services. Like the threads that make up the Bilum, the community capitals must all operate in a connected fashion to be effective.

The current study found that Pipol (human capital) generally scored very high in terms of people with grade 10 education or above (see Section 6.2) in all three communities. These results are significantly higher than the national averages. The UNDP report by Banks, et al., (2014: 51) reported that only 32% of the population had completed

primary school, perhaps reflecting the history of access to education in these communities and the fact that migrants moving in to mining areas are typically better educated (Banks, 2006). The current research results also reflect the education system of Papua New Guinea where many students leave after grade 10 or 12, consequently this leaves a small number making it to tertiary institutions. However, such levels of education themselves are not sufficient usually for people to make informed decisions about development choices and selective contributions to the community so as to ensure more resilient communities. In relation to training for health purposes, the formal education including grade 10 or 12 matters less because many of the interviewees were involved in other forms of training provided by agents who come from other stakeholders outside the community. Surprisingly it was found that much of the training in all three communities was often formally conducted. A possible explanation may be that this non-tertiary yet formal training is sought due to the lack of community-led informal training on aspects of health such as traditional healing methods. These high levels of involvement in training courses are consistent with other studies on training on aspects of personal and community development conducted in Papua New Guinea mining communities (Haro, 2010).

It is also worth noting that the community on Misima had an absent educated adult population with prior work experience on Misima, who were now being employed by other mines throughout the country at the time of this research. Botta, McFaul and Xavier (2014) emphasise that the most successful legacy MML left was job training for locals which has led to people who are now employed in other mines both within and outside Papua New Guinea (Shannon & Stoker, 2013). One unanticipated finding was

that current Misiman youth complained of being overlooked by government with limited opportunities to get an education or training for employment because the perception is that the area has a multitude of trained people (made redundant after the closure of MML). There were limited jobs available to these people. The findings of this study seem to be consistent with studies on MML that highlight how the mine had left behind the legacy of an educated and skilled population in Misima Island after mine closure (Botta, et al., 2014).

An important finding of this research was that family and kinship networks continued to be strong among community members at all sites, although there were some variations. Levels of *bung wantaim* (social capital) in the mining communities, then were an important source of resilience among the landowning communities. This finding is in contrast to literature (such as Filer, 1990) that suggests that large-scale mining breaks down social capital — ‘social disintegration’ in mine-affected communities in Papua New Guinea. There are several explanations for my findings; one could be that the benefits of mining are shared more equally among family or clan groups than found in the literature (see Section 3.4). In addition, there was a lot of interaction amongst the local community members involved in church activities. These results confirm studies on the significance of kinship and social relationships among Melanesian people (Bainton, 2010) and are important in terms of planning for building resilience. However, kinship relations can also be denied by other family members and kin who are in control of resources and can often prevent others from accessing these resources (Bainton, 2009). The level of resilience for *bung wantaim* does show some variation among the three stages of mining. Lihir and Misima scored higher while Hidden Valley’s score was lower, albeit



still significant. The reasons for this could include the fact that it is easier in terms of infrastructure for people to interact and become involved in community activities on small islands such as Misima and Lihir. The results in Lihir and Misima could also be linked to their physical environment with less rugged terrain and easier movement for people in comparison to Hidden Valley. It may also be that the early stages of mining (as at Hidden Valley) place greater stress on social networks due to the scale of the changes taking place and the huge amounts of cash that individuals and families receive directly. The more settled operational and post-closure phase appear to allow for the rebuilding of this social capital, which can then contribute more positively to building community resilience.

In terms of Kibung (political capital) there were limited interactions and networking between the GoPNG and the local community members in all of the communities. For most, interaction with the local-level government member was the only point of contact with the political system. In addition, youth expressed their perception that there was negligence from both village leaders and elders towards them. The results also showed that the community members had limited interactions with other relevant stakeholders, such as the mining companies (particularly in the case of MML), as well as with relevant authorities at all levels of government. In part this relates to the very limited local presence of the government in the mine-affected communities: village leaders also appear to have little faith in the opinions of youth and seek to impose their own agendas on the young people.

The limited community-government interaction was unexpected and suggests that in Lihir it is the mining company rather than the government that was contributing effectively to the community development projects such as assisting the local communities in agriculture, village housing and other infrastructure development (see Section 7.4.7). However these services established by the developer may not be maintained in the long run as there is lack of participation from Nimamar Local Level Government (NLLG) and LMALA and conflict over who should have authority in the running of NLLG (see Section 7.4.7). One explanation for this is that a lack of understanding and participation from the local authorities leads to less involvement, projects and tangible results from government projects, and hence a sense of disconnection from government for people, especially where the company provides these services (see Section 3.4.).

Much of the debate around the effects of mining emphasises the economic contribution of mining – and at the community level wokim moni (financial capital) is an important component required for building resilience. As mentioned in Chapter 3, over 70 per cent of Papua New Guinea’s export revenue, and up to 20% of government revenue, is derived from mineral resources. The current study found variations in the level of income in the three impacted communities. Surprisingly, the Hidden Valley community had a high level of income generation due to people’s on-going involvement in small scale mining, a result that matches other reports that show small scale mining is more common in the MOMASE and Island regions (as reported in Banks, et al., 2014). The higher average score in Lihir is a result of the on-going, significant financial flows from the mining operation (see Chapter 7). In terms of wokim

moni most people in Lihir within the SML and the broader Nimamar LLG had access to income opportunities such as employment or selling goods at the local markets. While this is positive in terms of building resilience, it does raise questions on the sustainability of the current income flows after mine closure.

These concerns raised about Lihir hold true for Misima. In Misima the results reflect the financial challenges that the interviewees encountered after mine closure (see Table 7.8). As noted above, people on Misima found it very difficult to access cash or other income after MML ceased its operation. While there were other alternatives such as copra and cocoa as cash crops for income generation, many felt that small-scale mining could provide them with a more reliable income. Some Misimans are now involved in this small scale mining sector which was supported by the GoPNG through the Mineral Resource Authority (MRA) base in Wau, Bulolo district (Interview field notes, 2012).

There were significant differences in the proxy indicator scores for wokim samting (built capital) between the three sites, indicating that some communities encountered challenges when seeking health services. The lower scores of 20% and 21% were in Hidden Valley and Misima, while Lihir had a much higher score of 69%. People in the first two communities struggled to access health and other services due to poor roads, a lack of health facilities, and a limited range of sanitation, health, power and communication infrastructure in the health sector. Surprisingly, and disturbingly, there is no real difference in these two communities that represent in this study the beginning and end of mining. In other words, ten years after mine closure, people on Misima show

no advantage in terms of access to health facilities and infrastructure than a community just at the start of its large-scale mining encounter. The difficulties experienced in accessing health infrastructure may be explained in part by the rugged nature of the country. This is confirmed by Pincock (2006) who said the rugged physical nature of PNG contributes to challenges in access to health services. One other possible explanation is that the GoPNG gives less attention to mine-impacted communities in the beginning and after mine closure stages, and hence there are far fewer resources available at these times.

Regarding Misima, the research was particularly interested in observing whether the built capital established during mining is available 'beyond mine closure'. The central finding in this regard was that infrastructure had deteriorated after mine closure and contributed to the difficulties encountered by the people to access health and other services. Infrastructure built during the operational stage of the MML mine, was underutilised now because there was a lack of resources available for maintenance. The MML mine was operating for 15 years but there are limited tangible results in Misima to show for it 10 years later, and this has impacted on community capitals and resilience. Chapters 6 and 7 noted corporate visions and plans for the sustainability of services after mine closure. In fact, this planning was done by the mining company with limited input or involvement from the GoPNG, the Church or the communities. Although in 2009 the GoPNG allocated K5 million per year for five years after mine closure for the rehabilitation of services including water supply, the hospital and the power supply; most of this infrastructure had already deteriorated. Figure 8.1 below shows one of the bridges built by MML that had deteriorated and now is of limited

value to the local communities. This built capital then contributes little to the overall strength of the weave of the community capitals, and by implication, little to the building of resilience in Misima.



**Figure 8.1: Port Micah 7 years after mine closure.**

Source: Fieldwork (2012).

Another key finding from above for Lihir was that the infrastructure of roads, water supply, and power supply in the community was generally good. There were good road linkages between the communities within the Nimamar LLG and hence the people have easy access to transport to get proper medical attention. There was also access to free potable water, and power supplies connected to the main landowner villages and their health facilities. The landowners within the SML and the surrounding communities could easily access health services, and this contributes to the strengthening of resilience in these communities. The mining company argues that it has contributed sufficiently to the establishment of new enabling infrastructure (see Section 7.4.7). The mining company has also contracted local landowner companies to build or maintain existing infrastructure, especially the road network. Several landowner companies on Lihir have been awarded the contracts to build health facilities (such as aid posts) but because of

their incompetency some of these are still incomplete (Fieldwork notes, 2012; Personal observation, 2012). This does weaken somewhat the contribution of the company to resilience in the impacted communities. The Lihir case must be interpreted with caution because the sustainability of these services after mine closure is uncertain, with many interviewees pessimistic about this.

In terms of *mama graun* (natural capital), Hidden Valley and Lihir had significantly higher proxy indicator scores (74% and 76% respectively), than Misima (54%). The results from Misima may be explained by the lack of rehabilitation of features such as the mine pits (see Fig. 8.2), which can contribute to health problems including breeding of mosquitoes that contributed to malaria for some time (Field notes, 2012), and provide few resources to the community. In Lihir, most community members still have access to much of their land and other resources such as medicinal plants. However, the landowners of the SML do face specific challenges in terms of access to gardening and hunting grounds with much of their land now occupied by the mine and its infrastructure, and access to more limited land and the natural resources in the areas outside of the SML. There were also issues with a lack of safe drinking water as the available sources of water were no longer to the villagers' satisfaction, being polluted by the effects of mining. In Misima, the land that was previously used by MML had had most of its original vegetation removed by the mine, and the former mine pit had been formed into lakes that are not used by the local people for fear of pollution.



**Figure 8.2: Former MML mine pit in Misima.**

Source: Fieldwork, (2012).

Kibung (political capital) showed low levels of interaction in all three communities. These proxy indicator scores reflect low access to decision-making at different levels of government, particularly those levels above the immediate Local-Level Government (LLG). Decision-making in this regard refers to influence over any issues or allocation of resources that affect people's wellbeing, particularly in terms of health in the communities. Community members have a high level of engagement in decision making at the community level, but in stark contrast there is a lack of involvement or influence of community members at the provincial and national levels of government. Although it can be argued that they are represented by appointed local officials such as the District Administrator or the Ward Councillor; their representation is usually highly constrained, thus limiting the opportunities for community members to make choices that may affect their access to services including health.

These findings are replicated in the negotiations of the MoAs where there often is a lack of inclusive local representation in decision making on benefit sharing and infrastructure requirements by communities (see Section 3.5). Results from the semi-structured interviews also revealed the lack of involvement people felt they had in the decision making regarding both health and mining issues (see Sections 7.3.1 & 7.3.2). This implies that people's opportunities to engage in decision making are greater at the community level, and this is where there is often less pressure for members to participate. Overall there is a marked and continuous lack of participation by the less advantaged groups, including women, in all mine-impacted communities (Macintyre, 2003).

In terms of *Pasin Tubuna* (cultural capital) indigenous, traditional healing approaches are still commonly used in all three communities. People's continuing engagement with the use of these indigenous healing practices (see Table 6.2) is illustrative of the strength of their ties to their cultural systems. These traditional healing approaches are also influenced by customary and Christian values and this medical pluralism can cause conflicting views in healing (Cox & Phillips, 2011). This outcome is significant because these traditional approaches to healing can contribute to the building of resilience by supporting health outcomes interwoven with the strengthening of local custom (Macintyre et al, 2005). Health workers interviewed in Hidden Valley and Misima had not observed many cases in which the use of indigenous approaches to healing in the hospital settings occurred; however they knew that people use these methods.

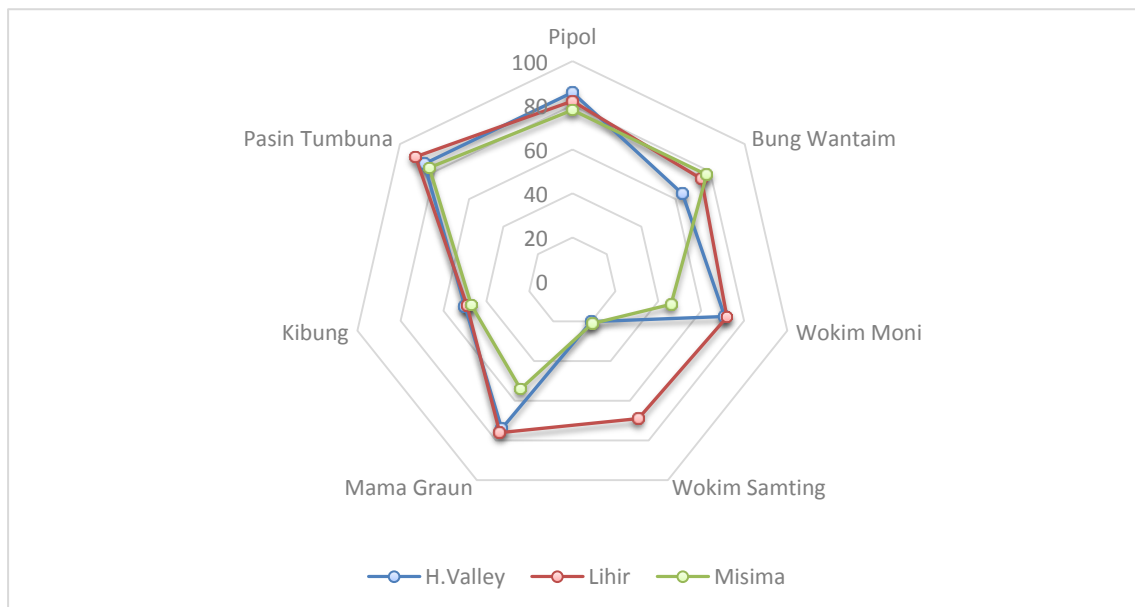


Pasin Tubuna though is undermined by a lack of formal policies or plans from the relevant stakeholders to support and nurture the cultural capital of the communities through such activities as their use of traditional approaches to healing. Although there is a policy on traditional medicine, the NHP (2010) does not mention its implementation. Furthermore, traditional medicine and customary values are not mentioned in the MoAs, and this does little to support the building of this type of cultural capital, and hence community resilience. Indigenous approaches to healing and customary values are closely integrated; in the Melanesian context their exclusion in the formal policies is like a Bilum with no handle.

The interactions between the seven community capitals are an important element towards the building of community resilience. For example, social capital in terms of kin helping with money which is financial capital to access health services or assisting with herbs that can also be a traditional medicine that is viewed in the perspective of both natural and cultural capital. The capitals complement each other, adding strength to the overall weave of resilience within the community: conversely the weakening of one capital can also undermine the overall strength of the Bilum. In terms of policy alignment, the Bilum cannot simply be lifted to carry things from one location to another, it depends on the coordinated interactions and actions of different parties — in other words policies that do not align cannot produce the best possible results.

### 8.5.1 An overall CRI for the mine-impacted communities

Figure 8.3 shows the overall CRI calculated for each of the community capitals in the three communities in this study. It provides a graphic illustration of the effects of mining on the levels of resilience at different stages in each of these communities. The shape of the Bilum varies from one stage to the next, reflecting the changing nature of resilience in these communities.



**Figure 8.3: The overall community resilience indices for the three communities.**

The overall CRI demonstrated some clear distinctions among the community capitals. The generally high levels of cultural, human and social capitals can be explained in the context of Melanesian societies where people are closely connected and as part of this, maintain strong links to customary values. The three communities also have relatively high levels of education, as noted earlier; although community members’ skills and

knowledge acquired through primary and secondary school are not fully utilised. Putting education aside, strengths from other capitals mentioned above can contribute positively to the building of community resilience. However, other strengths such as the bonding networks of social capital in these communities are not recognised, supported or integrated in the formal policy formulation environment. Meanwhile, the focus of the MoAs is mainly centred on financial and built capitals.

The main differences between the case studies were the scores for built capital where Lihir scored 0.69, well ahead of both Hidden Valley (0.20) and Misima (0.21). Hidden Valley and Misima, at the beginning and post-mine closure stages respectively, have lower levels of community resilience as a result of the limited existing infrastructure being able to facilitate effectiveness and efficiency in accessing health care. These low levels of built capital also highlight the relationship between financial capital and built capital as a dual challenge encountered by the interviewees in accessing the available health services. Lihir, on the other hand, demonstrated a higher level of provision of health infrastructure and other enabling features (such as well-maintained roads) which permit the Lihirians to have easy access to the available, high quality health services.

Most of the other community capitals did not vary greatly across the three case studies, although financial and natural capitals can be seen as lower on Misima, and social capital slightly down on Lihir. Overall, Lihir demonstrates a higher overall level of resilience based on these proxy indicators. Variations in accessing health services in the three selected communities also reflect the different stage of mining at the specific

time of data collection for this study. Misima in the post-mine closure stage, and Hidden Valley in the early stages of mining impact show that many people struggle to access health services. This reflects a range of factors (including the general levels of service found in rural Papua New Guinea, geography as well as the impacts of mining). Critically this highlights the fact that despite the enormous resources that mining brings to bear on communities, these do not necessarily translate into the building of more sustainable, resilient communities. This has implications for policy as discussed below.

The list of the challenges experienced in different stages by mine-impacted communities at different stages (see Table 6.3) and the results in terms of community capitals and resilience for the health sector, demonstrate the failure of the existing policy regime and the need for new approaches. The GoPNG need to give much more consideration to the early planning stages of mining to ensure the resources are available for the building of resilience in the affected communities. The same also applies to policy and planning for mine closure, the policy for which is still being debated in 2015. For example, the lack of sustainable enabling infrastructure on a practical level weakens the building of community resilience. Studies by Byford, (n.d) and Haney, et al. (2003) on the post-mine closure environment highlight a number of challenges in terms of the lack of employment, social services and community cohesiveness. An integrated policy framework developed by the GoPNG and refined for each site by the mining developers and the communities from the start of mining can prevent the challenges faced after mine closure. This policy issue is developed and detailed further below.

The lowest proxy indicator scores in the overall CRI was in Kibung (political capital) for all the communities. This was the case even on Lihir where Kibung proved to be the lowest of the capitals. Kibung is important in terms of the development of community resilience because communities need to be involved in the decision-making around their own communities and futures. When decision-making and power (over resourcing and allocation of benefits, for example) reside in the hands of others, there is no local ownership of decisions and hence outcomes tend to be poor. Only through greater involvement and participation in political processes and decision-making will more resilient and sustainable communities grow. The very low scores across the three operations do not bode well for resilience: the forces shaping the Bilum are not those of the owner.

## **8.6 The implications of the Bilum Framework**

The Bilum Framework approach can be used to direct resources towards the strengthening of community capitals that will build resilience. By implication it will also help to achieve the sustainability of health services in all stages of mining: greater levels of kibung, for example, make it easier to pressure government and developers to retain and maintain health services in the community. The Bilum Framework, as the object from which it takes its name, is a multipurpose bag in both traditional and contemporary Papua New Guinea. In order to build resilience, the different community capitals, like the many ropes of the Bilum, must be interwoven to achieve a strong end

product. Certain steps can be taken to promote this, including: consultation, research and policy formulation, and the monitoring and measuring of community resilience.

### **8.6.1 Consultation**

Most importantly, the Bilum Framework points to the need for consultation and collaboration amongst all the relevant stakeholders to drive and develop the formulation of an integrated policy framework so as to achieve higher levels of resilience through the delivery of health services. As with the Bilum, the community will be strengthened by integrating and weaving together the inputs of the different strands — government, developer, NGO and community. All stakeholders responsible for service delivery in the impacted communities need to collaborate to better understand the ways in which their respective contributions can strengthen resilience in the communities. Importantly, improved stakeholder consultation and partnerships in mining can contribute positively to a mining company's performance as well as broader development outcomes in terms of sustaining effective services during and after mine closure (Hilson & Murk, 2000). Regarding mine closure in PNG, the case of Misima must be taken as an example of how not to do it in terms of planning for mine closure, despite the government and corporate rhetoric. The mine closure plan for Misima began in 1996, but was only produced and made available in 2001 (Jackson, 2002, pp.12-13). This plan as Jackson revealed was represented at the time by the developer as an example for best practice in creating sustainable communities after mine closure. Despite this, the results from this study illustrated low levels of resilience

in Misima. As such, mine closure plans must involve all stakeholders in the beginning stage and ensure that building of resilience is an integral part of the plan that must be implemented.

### **8.6.2 Research and policy formulation**

The results from the research can provide pointers for future MoAs which can then be further integrated into broader policies such as the NHP. This view is supported by Wilson (2012), who argues for a multifunctional approach to build community resilience in rural areas. By this he means a policy approach that refers specifically to the integration of the various social, economic, political and environmental capitals. For example, in Papua New Guinea the NDoH should specifically require MOAs to relate to it. The Bilum Framework emphasises holism and integration, and this requires the identification of the existing strengths and weaknesses within the community capitals at the pre-mining stage — where does the Bilum need strengthening or protection for example — and from this, locally appropriate approaches can be developed by the stakeholders working together for the delivery of health (as well as other services) which reinforce this.

Wilson (2013) likewise emphasises the importance of the most effective policies being based on widespread consultation with the communities and the mining company on needs, priorities and changes, so as to be specifically tailored to suit particular communities. For example, cultural aspects can play a role in building community

resilience (Fernandes & Chamusca, 2014), and the cultural resources of particular communities need to be integrated into and accepted into local policy and approaches on a case-by-case situation. Studies by Lockie, et al. (2009) and Nelson, et al. (2010) on the application of individual community capitals in different communities including mining-affected localities demonstrate that the community capitals approach can produce positive results in the building of resilience by focusing stakeholders on the development of specific programmes to support these capitals. Cattel (2001) in his work on the role of social capital on disadvantaged neighbourhoods and poverty, portrays positive results through social networking. Other work (for example Shortt, 2004; Veenstra, 2002, p.849) has found measures taken to strengthen social capital to be insufficient in health policy and there being a poor relationship between social capital and the determinants of health in terms of “age-standardised mortality rates”. The lessons from these studies match those put forth for using a Bilum Framework, thus the need for an integrated approach to health is important in mining impacted communities, and the specific needs and policy approaches must be identified through research and consultation that covers all of the community capitals.

Kitula, (2006), Lockie, et al. (2009) and Pektova-Timmer, et al. (2009) have identified another research agenda, with the application of social impact studies that identify both the social and environmental aspects of the destruction that can be caused by the mining operations. The integration of these results into a policy framework is by itself not clear; and the Bilum Framework would indicate that these studies need to be complemented by research into the other capitals: financial, cultural, built and political, in order to build a comprehensive policy framework that supports community



resilience. To date, though, these results are mainly employed by the individual stakeholders such as the mining company, and in most instances decisions are still influenced more by management practices than by research (Cragg & Greenbaum, 2002). These realities of the practices of those in authority can determine approaches to and outcomes of the environment and social destruction in the mining impacted communities. The Bilum framework clearly requires the need for a much more 'whole of government' form of approach, drawing together the threads of all the different stakeholders — corporate, government, NGO, donor and community to achieve sustainability in terms of health services and resilience.

### **8.6.3 Community Resilience: Implementation and measuring**

Approaches to resource development within a Bilum Framework also demand regular monitoring and measurement. This research has demonstrated that the strength of community capitals and resilience shift over the course of time, impacted by factors such as the arrival and departure of a large-scale mine, as well as by the revenue flows, migration and environmental impacts. Hence implementation of community development under this approach requires indicators that can measure the performance of the different services including health and other support services. Surveys such as those carried out for this research — paying attention to the integration and weave of the community capitals within the Bilum Framework — can form part of such a monitoring framework. Since the mining industry faces challenges in sustaining services, developing indicators to measure its performance can be helpful (Azapagic, 2004). The evaluation of policy can play a significant role in showing how level of services delivered in the concerned communities has been affected, and the

outcomes of these policies. Mining companies through their CSR programmes typically provide performance reports (Jenkin & Yakovleva, 2006), and these can be integrated into policy that will allow for other stakeholders like government departments (*such as MRA*) and officials to work in partnership with the mining companies to measure and monitor community resilience. It is important to monitor levels of community resilience as it can provide direction for developing more sustainable communities through the development and protection of specific community capitals.

## 8.7 Conclusion

This chapter has brought together discussion around five main themes from the research: (i) the continuing lack of access to health services, (ii) the poor governance within the sector, (iii) the determination of levels of resilience using proxy indicators, (iv) the calculation of the overall CRI, and (v) the application of the Bilum Framework to open up new ways of understanding and thinking about community capitals, mining and resilience. These issues arose from the research findings presented in Chapters 6 and 7.

The chapter showed how the implications of poor governance create a raft of other issues including the damaging lack of policy alignment and poor support services. The argument is that the lack of alignment in the policies relating to health and other support services is a critical factor in creating the difficulties in communities accessing health services. Inadequate enabling infrastructure also helps to account for the challenges faced by the communities studied in this research.

Lack of policy alignment by the GoPNG and mining companies under the MoAs is the main contributing factor to the difficulties encountered by the mining communities. These communities lack access to health and other support services. The state needs to take the initiative to formulate and effectively implement a policy for building community resilience through CCs to achieve sustainable communities. The roles and responsibilities of all stakeholders at each stage of mining: beginning, operational and after mine closer need to be spelt out clearly. These roles and responsibilities must be focussed on ensuring the sustainability of health and other support services beyond mine closure.

The development and application of proxy indicators of capitals in the communities clearly showed that there are relatively low levels of resilience in the mining impacted communities, and critically, those communities in the early and post-mining phases experience many of the same difficulties accessing health services: only when the mine is operating are these issues mitigated to an extent. The CRI developed within the Bilum Framework is based on 14 proxy indicators (see Tables 8.1 and 8.2) that provide insights into the seven different community capitals and the effects of mining across the three stages (early, operational and post-closure).

Finally the chapter explored some of the ways in which the Bilum Framework can help to inform policies and practices relating to large-scale mining in Papua New Guinea, particularly in terms of the need for community participation, policy formulation, and monitoring and measurement. The following, final chapter builds on these themes,

and looks to both broader lessons from the thesis in terms of the original research questions, and the scope for research that builds on the findings of the current research.



# Chapter 9

## Conclusion

### 9.1. Introduction

In concluding this thesis, this chapter returns to the question that initiated this research, using the discussions and results to fulfil the aim of the thesis. The study explored the ways in which the building and maintenance of community resilience in mining communities in Papua New Guinea was affected through the delivery of health services. The study developed a Bilum Framework as a metaphor and tool to better understand the effects of large-scale mining on the interactions between community capitals in the health sector. The chapter begins by recapping the aim and the four research questions. These four questions are utilised to structure the chapter, hence by drawing in findings as noted in prior chapters, a synthesis of the results and any discussions are given. The limitations of the study, and the implications of, and suggestions for, future research are set out, before concluding with final reflections on mining, health and community resilience in Papua New Guinea.

### 9.2 The aim

This study aimed to explore the role that health services can play in building resilience in mining communities in Papua New Guinea. This study uncovered the influences and challenges that inhibit the effective and efficient delivery and/or maintenance of health

services in these communities. This research further investigated the link between the delivery of health services and how these services contributed to the building of resilience through the use of a community capitals framework. The study was guided by four Research Questions:

- 1. What is the link between Community Capitals, Community Resilience and the delivery of health services in mining-impacted communities?*
- 2. What are the constraints or contributions (in terms of policy and/or implementation) on the delivery of health services to these impacted communities that inhibit the strengthening of community resilience?*
- 3. How can community resilience and community capitals be assessed through the delivery of health services?*
- 4. How does a Melanesian-centric 'Bilum Framework' approach to community capitals allow for greater understanding of the opportunities and challenges of building resilience through improved access to health services in mine-impacted communities?*

These questions provided a focus for the study and determined the need for a mixed method/triangulation methodological approach for the collection of data for this study. In the following subsections each of these questions are evaluated in relation to results derived from the application of these research methods.

### 9.3 The relationship between community resilience and community capitals

Research Question 1 developed the theoretical ground for the links between the concepts of community resilience, community capitals and the delivery of health services in the mining communities. The definition of resilience adopted in this study highlights the building of community strength from negative experiences (Berkes & Ross, 2013; Kulig et al., 2008; Magis, 2010) through the development of the community capitals (see also Robinson and Carson, 2015). Together, the interaction of these capitals can support and build the capacity of a community to become more sustainable and resilient. The literature (Aletras, et al., 2007; Kontodimopoulos & Niakas, 2006) highlighted the importance of being able to provide indicators of changes in the overall resilience of a community so as to track changes as a result of external influences, such as government policy and/or large-scale mining.

Of importance is not only the development of strength from negative experiences and events, but the ability to positively respond so as to retain or enhance the sustainability of services in a community at all stages of mining-**commencement, during and after**. The literature indicated, and this was supported by my fieldwork findings, that the process of building resilience involves collective planning to respond to both internal and external influences and hence build the capacity to absorb and adapt to change so as to positively direct a community's own future. This requires the participation of all relevant stakeholders over the long term and at all stages of mining so as to develop capacity in the mining communities to safeguard the resilience and sustainability of the communities as well as the services that support them.



## 9.4 Constraints on health services

Research Question 2 investigated the constraints on the delivery of health services that hindered the building of community resilience. This question required a broad ranging exploration of the challenges that hampered the effective and efficient delivery of health services in the three communities.

The literature and background material reviewed in Chapters 2 and 3 revealed that the introduction of the OLPLLG was a major detriment to the delivery of health services in the selected case study sites, as well as elsewhere in Papua New Guinea. Chapter 2 highlighted the negative impact of successive stages of decentralisation of health services in Papua New Guinea, including the resulting lack of transport and management training. These chapters showed challenges encountered by both the providers and users of health services. For example, the health facilities typically experienced staff shortages and irregular supplies of medicines while the sick, especially in the rural areas, often had limited access to these services due to financial constraints and poor infrastructure such as roads.

Data from the survey questionnaire in Chapter 6 underscored the weaknesses in some of the community capitals that prevented access to health services and resources in the selected communities. The common issue was the lack of financial resources to build community capitals, although this varied across the different stages of mining. In both the early mining and the post closure stages, there were significant weaknesses in some of the capitals (built, financial, political) that resulted in relatively poor delivery

of health services to the communities which in turn contributed to a weakening of resilience. Interviewees in the early and after mine closure stages faced challenges in access to health services, largely due to a lack of finances, infrastructure and problems arranging transport. The development of proxy indicators provided an original way of generating specific figures for the measurement of the levels of resilience among the different communities.

The quantitative results from the survey questionnaire are supported by the findings from the semi-structured interviews and the purposive observations which draw attention to the specific policy circumstances in each mining community, and the influence this has on the delivery of health services, and the impact on community capitals and resilience. The respective MoAs from Hidden Valley and to a lesser extent Lihir are not well integrated with the NDoH's NHP (and in the case of Misima never were). Three major challenges were identified: a lack of collaboration between the relevant stakeholders, a lack of harmony between policy initiatives, and a lack of the provision of services in accordance with the policies. Together these factors illustrated that the building of resilience in mining communities is dependent on, and also contributes to, the sustainability of effective and efficient health services for the community. It was also evident though, that strengthening community capitals through improved transport and income generation opportunities to support provision of health services was not a primary concern for any of the external stakeholders. This obviously prevents the building of community resilience to promote sustainable communities.

There were four key aspects from the NHP's vision and the three MoAs for the mine developments that further constrained encompassing and effective health delivery for the selected communities: (i) mining companies tended to predominantly establish infrastructure rather than deliver services; (ii) MoAs classically exclude meaningful landowner input into their desired health service outcomes; (iii) in each case there was a lack of research to establish community priorities and commitment to providing the planned health resources; and (iv) there is low capacity (in government, and in the mining company) to effectively deliver an integrated health service to the affected communities.

With the exception of Lihir the references to health in the MoAs are mostly generic, and classify the delivery of health services under a heading of community infrastructure and social services. In the case of the Hidden Valley and Misima communities, their MoAs with the company do not provide guidance on the relationship with the NDoH, and do not mention support for what can be regarded as elements of community capitals (particularly political or cultural capital). Neither the NHP 2011-2020 nor the MoAs have tightly worded clauses around the implementation of these policies and there is no stress or reference to the need to maintain a high level of health services during mining and after mine closure.

## 9.5 The significance of measuring community resilience

Research Question 3 sought to develop an original method for measuring community resilience through the proxy indicators of community capitals, and from these calculating a composite community resilience index. This question required the identification of proxy indicators from the community capitals and measured the level of resilience in each of the selected mining communities at the different stages of mining.

The literature on measuring resilience confirmed the importance of measurement as a tool to guide processes of building resilience. There are various methods that can be utilised to measure community resilience. Chapter 5 presented the details of how an alternative assessment methodology to measure community capitals was formulated, based on the framework established by Flora and Flora (2005). The assessment methodology was then applied to determine the levels of resilience in each of the selected case study sites.

Chapter 6 outlined the results from survey questionnaires relating to the participants' access to health services and their views regarding the strength of the different community capitals. The interviewees in the three selected communities revealed both strengths and weaknesses in the seven capitals in these communities. In Hidden Valley and Misima results showed weaknesses in wokim samting (built capital), wokim moni (financial capital) and mama graun (natural capital). Wokim samting was the weakest in both communities. The other four capitals: pasin tubuna (*cultural capital*), pipol

(human capital), and bung wantaim (social capital) were stronger in these two communities, with bung wantaim the strongest in both communities. Lihir in comparison to the Hidden Valley and Misima had higher levels of wokim samting. These variations were supported by the results from the semi-structured interview findings in chapter 7. This shows that the proxy indicators and CRI are useful tools for identifying the community capitals that need support from the state and the mining company.

## **9.6 The Bilum Framework: An alternative in understanding community resilience**

Research Question 4 asked whether, and how, a Melanesian framework - the Bilum Community Capitals Framework — could enable a greater understanding of the ways in which access to health resources and facilities in mine-impacted communities could influence the strengthening or weakening of community capitals, and hence overall community resilience. This question required an examination of the general contributions of the various community capitals in building resilience in the Melanesian context. The review and analysis of literature that discussed mining impacts in the Melanesian context influenced the formulation of the Bilum Framework that was then applied to the interactions between the community capitals and resilience in a Melanesian context. Each of the seven capitals used in existing models of Community Resilience (see Flora and Flora 2005; Robinson and Carson, 2015) were adapted to better fit the Melanesian context (with a strong emphasis on the different cultural understandings of each of these) and integrated into this Melanesian variation

of the framework. One key difference is the greater sense of the interrelationships among the capitals in the Bilum context: closer links to land and relationships between people that extend deeply into political, social, economic and even natural capital. Each of these capitals separately plays a role in contributing towards the building of community resilience in the mine impacted communities in Papua New Guinea, but it is the holistic approach to them that makes it distinctively Melanesian.

The Bilum Framework has been applied as a basic paradigm in the mine impacted communities to assess, and focus, efforts to strengthen resilience, through a focus on the ways in which the maintenance of effective health and other services in all across all stages of mining can build resilience, as well as make these services themselves more sustainable for communities. Resembling the different uses of a Bilum, the different elements of the capitals approach can bring strength to different aspects of community life, and together the interactions among the community capitals foster stronger levels of community resilience. The capitals are all interconnected, and function in this sense as a Bilum where each single rope is important. If one of the strings is cut, it will weaken the Bilum which can then continue to unravel, break apart and eventually be totally destroyed. The weakening of one capital has a negative impact on the others. To attain resilient and sustainable communities all the community capitals must work collaboratively within the Bilum Framework.

The focus on the interactions among the community capitals within the Bilum Framework provides pointers to its possible broader application. The Bilum Framework emphasises that work to support communities through transformative changes (such

as the arrival, operation and departure of a large-scale mining project) must emphasise collaboration; all stakeholders must work in partnership in identifying the priorities for community development: they must consult each other and carry out research to identify priorities for concerned communities for collective planning, implementation and measuring of resilience.

## 9.7 Limitations of this research

There are some limitations that must be acknowledged in this study including limitations of the data collected and methodological challenges. The qualitative interview data for the mining companies does have limitations as only one mining company was represented. I did not access the companies from the beginning and after mine closure stages of mining, as at Hidden Valley, the management denied me access to their staff and to conduct interviews while in the case of Misima MML had closed its operations in 2004, 8 years before this research so I had no way to interview company employees, although this was supplemented by literature on corporate approaches to community and health in Papua New Guinea (Thomason & Hancock, 2011). Analysis of the mining companies as stakeholders in their respective host communities by using information from only 1 mine was a limitation. Mining companies are multi-national corporations with different goals for providing health and other services. These goals may not align with government policies on service delivery and this highlights the need to integrate these national goals into the MoAs for each mine. In addition, several key informants from DMPGM and the Department

of Provincial Affairs could not be interviewed due to time constraints and non-availability of these staff members due to other commitments.

Another aspect that limited the range of data is that the survey questionnaire only targeted local people within the vicinity of these mining operations. This may contribute to a distortion in the measurement of resilience in the mining communities because the figures do not include non-locals who have moved to the area, such as migrants who have secured employment with the company and become integrated into the community. Also, the Bilum Framework covers a wide range of community capitals, and as with any quantitative measure, this may generalise a range of complex dimensions of economic and social life. Some may also view the Bilum Framework as being too broad in its scope to act as a guide to building community resilience in the mine impacted communities. However, this research is the first work to look at the issue of community resilience in this way in the Melanesian context so it opens up space for further investigation, as discussed below.

## **9.8 Implications for further research**

This research has investigated four aspects of building community resilience through the delivery of health services in communities affected by mining in Papua New Guinea: the alignment of policies (NHP and the MoAs), the implementation of these policies, the effects of mining on health and interaction of community capitals, and the measuring of resilience in these contexts so as to better direct support for these communities. This study has not specifically examined issues such as the monitoring



and evaluation of infrastructure or health services established under the tax credit scheme (TCS) or other negotiated benefits streams, nor has it investigated the processes and negotiations surrounding the formulation of the MoAs. As a result, this research indicated that to better understand the opportunities and challenges for building the resilience of mine-impacted communities' further research in the following areas is needed:

- (i) *Monitoring and evaluation of the corporate-derived health services established under the negotiated agreements (including the tax credit schemes) in the impacted communities by the MRA or other responsible GoPNG agency.*

This research has found low levels of resilience in built capital; despite a range of infrastructure development plans and agreements (such as under the TCSs), implementation of these plans in Hidden Valley, Lihir and Misima, has been poor. As analysed prior (especially in Chapters 3 and 7), there is significant infrastructure constructed in the mining communities with the arrival of a large-scale mine that can potentially represent a major benefit to the resilience of these communities. These benefits need to be monitored in terms of their use to ensure they are contributing to the overall long-term development of these communities. At Hidden Valley there is a lack of visible and accessible health facilities, while on Lihir there are concerns about the maintenance and sustainability of the corporate facilities (and the lack of government support for health facilities and services) and Misimans have little to show in terms of infrastructure for the almost 20 years of mining activity. Filer (2004) has found that the decentralisation of administrative powers through the introduction of the OLPLGs has contributed to the mismanagement of funds for many of these

facilities under the Tax Credit Scheme. Further research should explore the monitoring and evaluation carried out of services such as roads, and buildings in the form of classrooms, health centres and aid posts, to understand the impact of the investment made in developing the capacity of the impacted mining communities.

- (ii) *The processes surrounding the negotiations and formulation of the MoAs, so to prevent misunderstandings such as around the responsibility for specific services and performing tasks not included in the original MoAs.*

The processes surrounding the negotiation and formulation of MoAs is another significant area that requires further research to understand the power issues that frame the participation of stakeholders. As Filer (2004, p.6) illustrates for the experiences of the PDA:

*Managers were acting to address the demands of the local community in order to take the heat off the mining company, which might otherwise be held responsible for the failure of other government agencies (or stakeholders) to meet their obligations.*

Polume-Kiele (2014, p.4) confirms the lack of participation of government institutions and other stakeholders in executing relevant MoAs. The roles and responsibilities of each stakeholder need to be clearly spelt out, and in particular local community voices (especially marginalised groups such as women and youth) interests must be heard, in order to effectively integrate these diverse perspectives in the negotiations that develop the terms and conditions of the respective MoAs. The need for such research is also recognised by the recent UNDP (2014) report, and may go some way to create novel avenues to ensure the sustainability of services in all stages of mining.

## 9.9 Conclusion

This thesis sought to explore the role that health services can play in building resilience in mining communities in Papua New Guinea. In doing so, it has made three significant and original contributions to knowledge:

- *it has provided a comparative case study of the effects of large scale mining on the accessibility of effective health services at three large-scale mine sites in Papua New Guinea, over three stages of mining;*
- *it has explored the provision of health services, and the impact of large-scale mining on health, through the lens of community resilience; and,*
- *it has developed an original Melanesian specific framework of community capitals to provide an index of community resilience that can be applied across the different stages of mining to better support the building of community capacity and resilience.*

The comparative case study methodology was a critical and original element of this research as it allowed for a broader set of results to explore the delivery of health services and the building of community resilience at different stages of mining among the three communities. The case studies were built around a triangulation approach which utilised a combination of research methods to collect sufficient data for more

reliable and validated results. The qualitative approaches were directed more towards people's experiences in their local settings while the quantitative method was more focussed on generating numerical data so as to be able to provide measures of resilience across the communities and the different stages of mining.

This study has shown that the levels of community resilience varied among three selected communities: Hidden Valley, Lihir and Misima. Hidden Valley, as the mine that was used to illustrate the delivery of health services in the beginning stage of a mine, revealed serious limitations in networking and collaboration, a lack of local participation in decision making by the health workers and community members in the delivery of health services, a lack of financial resources, a lack of enabling infrastructure, a shortage of health workers, and an irregular supply drugs. The nature of the challenges had reduced the capacity of the Hidden Valley mine to build community resilience. The findings illustrated a range of complex issues at Hidden Valley in the provision of health services, partly due to the decision making of corporate management who dealt with resources in the delivery of health services. At the same time, the decentralisation of powers from the national government to the provincial and local governments through the introduction and application of the OPLLG in Papua New Guinea has become a major challenge in the delivery of health and other services, across the country, but also in these mine-impacted communities.

Findings in Lihir, at the operational stage of mining, revealed that people on Lihir had better access to more effective health services. The most significant findings to emerge from this study, however, was that the support facilities and services were provided

mainly by the mining company rather than government. The community depends heavily on these services provided by the mining company which raises concerns about their sustainability. The two most obvious challenges to health services delivery that emerged from Lihir were a lack of finances for individuals and for the provision of health services. Even though there is significant wealth on the island, some community members had insufficient funds to pay for health services. The health services run by the GoPNG and Catholic Church faced resourcing difficulties with transport and could only operate with assistance from other agencies that existed because of the mining operations (especially the Lihir Medical Centre). Having to rely on other non-government health agencies in turn detracts from the building of community resilience.

In Misima, the community now in the post-mine closure phase, findings from this research revealed a decline in the efficiency and effectiveness of the delivery of health services from the operational phase. The challenges faced include a lack of health workers, lack of finances, difficulties in road and transport, delays in drug supply, sanitation issues at the health facilities, and poor communication and power supply. Misima then illustrated the community dependency that can be created by the mine for available services such as the power infrastructure developed for mining. This shows how fragile resilience is unless supported by investment in community capitals.

On the other hand, the Misima findings when compared with Hidden Valley, illustrate that by the post-closure stage, accessibility to health services was better than in the beginning stage of mining. This implies that the delivery of services including health

can be sustained if all stakeholders collaborate and develop plans that will be implemented in partnership during mine operations and after the mine closes.

All stakeholders must bear at least some responsibility for building community capitals in order to achieve resilience in the mining communities. The state though must take a lead to establish a community resilience policy that calls for all stakeholders to work in partnership, with specific clauses within the policy that outlines each partner's roles and responsibilities to implement in building community capitals. It is the state's responsibility to ensure that the mining companies and the impacted communities abide by the policy and the agreements that occur under it. An overarching policy inclusive of clearly stated roles and responsibilities of all stakeholders is essential to ensure that people have access to effective and efficient health and other services in the mining communities.

Overall the results show that the delivery of health services in the beginning stage of mining and after mine closure is confronted with more challenges than those in the operational stages. The communities close to operational mines, though, depend heavily on the mining company to support their health services and meanwhile the GoPNG gives low priority to the building of the various community capitals. A significant problem is that there is lack of policy alignment among the stakeholders, and the relevant parties largely plan the delivery of health and other services in isolation. The communities impacted by mining are then confronted with more challenges in terms of accessing effective health services in the early and post-mine closure stages.

To ensure the maximum effect of stakeholder partnerships and collaborations, this study proposed the Bilum Framework to help focus efforts to build sustainable health services and hence strengthen community resilience. As such, efforts to enhance community resilience can be optimised by using an approach that focuses on the interactions that occur among the Bilum Framework.

The Bilum Framework is developed here to maximise efforts for the building of capacity within communities, and hence strengthen resilience. This framework provides a means to direct investment in specific community capitals at the different stages of mining by the national government and other stakeholders to strengthen resilience and ensure the sustainability of services. This research clearly shows that relying on mining companies to develop and provide services without sufficient guidance and strategic planning from government results in unsustainable services and poor outcomes for communities once mines close. For example, had Misima's health services been supported with training opportunities for health workers and dedicated transportation then the services could have continued with minimal disruption once mine support was withdrawn. Therefore, a focus on the relative strengths and weaknesses of the community capitals within the Bilum Framework can contribute to the creation of more resilient and sustainable communities at all stages of mining.

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# Appendices

## Appendix 1: Massey University ethics approval



MASSEY UNIVERSITY

TE KUNENGA KI PUREHUROA

11 May 2012

Dora Kuir-Ayius  
64 Joseph St,  
West End,  
PALMERSTON NORTH 4412

Dear Dora

Re: Building Community Resilience in Mine-Impacted Communities: A Study in Papua-New Guinea on Health Services

Thank you for your Low Risk Notification which was received on 3 May 2012.

Your project has been recorded on the Low Risk Database which is reported in the Annual Report of the Massey University Human Ethics Committees.

The low risk notification for this project is valid for a maximum of three years.

Please notify me if situations subsequently occur which cause you to reconsider your initial ethical analysis that it is safe to proceed without approval by one of the University's Human Ethics Committees.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:

*"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics*

## Building Community Resilience in Mine Impacted Communities

Committees. The researcher( s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher( s), please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail [human\\_ethics@massey.ac.nz](mailto:human_ethics@massey.ac.nz) .

Please note that if a sponsoring organisation, funding authority or a journal al in which you wish to publish requires evidence of committee approval (with an approval number), you will have to provide a full application to one of the University 's Human Ethics Committees . You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely



John G O'Neill (Professor)  
Chair, Human Ethics Chairs'  
Committee and Director  
(Research Ethics)

cc Assoc.Prof  
Glenn Banks  
School of People,  
Environment and Planning

PN331

Dr Rochelle Stewart-Withers  
School of People, Environment and  
Planning

PN331

Mrs Mary Roberts, HoS Secretary  
School of People, Environment and Planning

PN331

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Massey University  
Human Ethics Committee  
Accredited by the Health  
Research Council

Research Ethics Offce, Massey University, Private Bag 11222, Palmerston North  
4442, New Zealand T +6463505573 +6463505575 F +6463505622

## Appendix 2: Letter to stakeholders for research approval



MASSEY UNIVERSITY

TE KUNENGA KI PUREHUROA

Date: 07<sup>th</sup> July 2012

The Secretary  
Department of Mineral Policy and  
Geohazard Management Office of the  
Secretary, Port Moresby  
Private Mail Bag  
Papua New Guinea

Dear Sir/Madam,

### **Re: Consent to do Research**

My name is Dora KUIR-AYIUS, a Papua New Guinean who is currently pursuing a Doctor of Philosophy (PhD) degree in Massey University, New Zealand. My research topic is 'building community resilience in mine impacted communities: a study on the delivery of health services in Papua New Guinea'. This study focuses on building community resilience in mine impacted communities in PNG and concerns how appropriate health services can be made available and accessible to the mine impacted communities both during and after mine closure.

The study further explores the potential for using the current health policies of government and mining companies and their implementation process towards building community resilience. It is envisaged that the findings of this research will contribute to the planning and sustainability of local services including health, and contribute towards better living standards in mine impacted communities. As part of the university's requirement towards fulfilling this degree, I am required to undertake research work in my home country.

With due respect, I wish to kindly request your permission and support to conduct this research. I would be very grateful for an opportunity to meet with yourself or one of your staff to discuss my research and if possible identify

potential candidates within your ministry that I could interview for my research. I do acknowledge the workload of the ministry, hence, will do my utmost best not to take too much time off your staff members. The proposed starting date for my fieldwork in 15<sup>th</sup> August through to mid-November but will spend only a day or two in your department interviewing certain officers who are involved in carrying out responsibilities related to my study.

In preparation for the fieldwork, I have completed the Massey University ethics process which addresses issues relating to confidentiality and privacy of participants. As such, it is important to clarify that I have no hidden agenda behind this research project. It is for academic purposes but its findings can also be used in one way or another to by the relevant stakeholders to plan for the enhancement of community resilience in mine impacted communities in PNG.

My research is guided under the supervision of Assoc. Professor Glenn Banks and Dr Rochelle Stewart-Withers. They would be very happy to discuss any concerns/issues that you may have regarding this research project.

Assoc. Prof. Glenn Banks

School of People, Environment and

Planning Massey University

Private Bag 11-222.

Palmerston North

New Zealand

Email: G.A.Banks@massey.ac.nz

Dr Rochelle Stewart-Withers

School of People, Environment and

Planning Massey University

Private Bag 11-222.

Palmerston North,

New Zealand

Email: r.r.stewart-

withers@massey.ac.nz |


can be contacted by:

Mobile: +64 02102759014

Email: dora.kuir@gmail.com

Thank you for taking time to consider this request and I look forward to hear from you.

Yours faithfully,

A handwritten signature in blue ink, enclosed in a hand-drawn oval. The signature appears to be 'Dora Kuir-Ayius'.

Dora KUIR-AYIUS

Researcher

## Appendix 3: Research assistants consent form



MASSEY UNIVERSITY

TE KUNENGA KI PUREHUROA

Dear \_\_\_\_\_,

### Re: Consent to be a Research Assistant

With due respect, I wish to kindly request your consent to be a research assistant in this research project. This research is on 'building community resilience in mine impacted communities: a study on the delivery of health services in Papua New Guinea'. It will focus on building community resilience in mine impacted communities in PNG and concerns how appropriate health services can be made available and accessible to the mine impacted communities both during and after mine closure.

Your assistance in this project is highly valued because your participation will contribute significantly to data collection. Therefore, how you conduct yourself when talking to people is very important. As such, any information that is collected from the interviewees is treated with respect and confidentiality.

By signing this letter you agree to conform to the rules laid out for you as a research assistant.

Dora KUIR-AYIUS      Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Research assistant

## Appendix 4: MRA email communication

Hi Dora,

Good to hear from you and it seems your research is coming along well.

I have copied in Sean and Ipidari from the Development Coordination division of the MRA who will be available to discuss aspects of your research with you. We will be happy to receive a copy of your research findings if the University will allow that.

Sean/Ipidari,

Please make time to discuss with Dora when she is in town. Refer her letter of introduction which is attached. Regards,

Philip Samar  
Acting Managing Director  
Mineral Resources Authority  
PO Box 1906  
Port Moresby 121  
Papua New Guinea

**Phone:** (675) 3213511

**Fax:** (675) 3200189

**Email:** psamar@mra.gov.pg

**Website:** www.mra.gov.pg

From: Dora Kuir- Ayius [mailto:dora.kuir@gmail.com]

Sent: Tuesday 17 August 2012 12:43 PM

To: Philip Samar

Subject: seeking consent

Hi Philip,

I am a student doing a thesis on building community resilience in mine impacted communities in PNG. I am now in the stage of collecting data so need to be in touch with relevant departments. I was in contact with you last year regarding my topic so I thought I get in touch again with you. I tried emailing your development coordination branch but couldn't get through. Please refer to the attachment for more information.

Kind Regards,

Dora



## Appendix 5: Approval letter from NDoH



**Government of Papua New Guinea**  
**Medical Research Advisory**  
**Committee**

PO Box 807  
WAIGANI 131, NCD  
PNG

**National Department of Health**

Phone: + (675) 3013650

Fax: + (675) 325 325

Email:

[urarang\\_kitur@health.gov.pg](mailto:urarang_kitur@health.gov.pg)

ILE: S4-6-2

DATE: 11/1()f2012

**TO WHOM IT MAY CONCERN**

Dear Sir/Madam,

**SUBJECT: MEDICAL RESEARCH ADVISORY COMMITTEE CLEARANCE TO COLLECT DATA**

This letter is to advise you that Dora KUIR-AYUIS , A PhD candidate at the Massey University is conducting a study, "**Building Community Resilience in Mine Impacted Communities: a study in Papua New Guinea on Health Services**" as part of her thesis. She is required to collect data from various Mining communities in Papua New Guinea.

The results from her studies will inform policy on how the Government can sustain and maintain health service delivery in mining communities after the mine has closed.

Her research protocol has been submitted to the MRAC and I have reviewed her protocol. Her study is a low risk study where the researcher will conduct interviews. I hereby give approval for her to visit your community and district to collect the necessary information for her study.

The Medical Research Advisory Committee of Papua New Guinea act as the National Ethical Clearance Committee and as the Institutional Ethical Committee for the Papua New Guinea Institute of Medical Research.

If you require further information please do hesitate to contact our office on 3013660.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Urarang Kitur', with a large, stylized flourish extending to the right.

**Dr. Urarang Kitur**  
**Chairperson**

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**SERVICE DELIVERY TO THE RURAL MAJORITY AND URBAN POOR**

## Appendix 6: Survey questionnaire

<b>1. Personal details: Informant &amp; Spouse</b>	
<b>1.1 Level of education (Informant)</b>	
1.1.1	University degree and above
1.1.2	Diploma
1.1.3	Grade 12
1.1.4	Grade 10
1.1.5	Grade 8
1.1.6	Grade 6
1.1.7	Below Grade 6
<b>1.2 Formal acquired training skills</b>	
Who offered training?	
1.2.1	Government agencies
1.2.2	Developer
1.2.3	Spin-Offs businesses
1.2.4	None
<b>1.3 Informal training</b>	
1.3.1	Village elders
1.3.2	Traditional social structure
1.3.3	None
<b>1.4 Employment status</b>	
Who is your employer?	
1.4.1	Developer
1.4.2	Government Agencies
1.4.3	Other business spin-offs
1.4.4	None
<b>1.5 Community activities</b>	
What sort of activities do you get involved in?	
1.5.1	Customary obligations
1.5.2	Sports and youth
1.5.3	Church
1.5.4	Council
<b>1.6 Level of education (Spouse)</b>	
1.6.1	University degree and above
1.6.2	Diploma
1.6.3	Grade 12
1.6.4	Grade 10
1.6.5	Grade 8
1.6.6	Grade 6

1.6.7 Below Grade 6

**1.7 Acquired skills/training**

Who offered training?

1.7.1 Government agencies

1.7.2 Mining company

1.7.3 Developer

1.7.4 Spin-Offs businesses

1.7.5 None

**1.8 Informal training**

1.8.1 Village elders

1.8.2 Traditional social structure

1.8.3 None

**1.9 Employment status**

Who is your employer?

1.9.1 Government

1.9.2 Developer

1.9.3 Other business spin-offs

1.9.4 None

**10.1 Community activities**

What sort of activities do you get involved in?

10.1.1 Customary obligations

10.1.2 Sports and youth

10.1.3 Church

10.1.4 Council

**2. Income generating activities**

What are some alternatives you engage in to generate income?

2.1 Small scale businesses (small scale mining, trade stores)

2.2 Formally established business activities

2.3 Informally selling things in local markets from time to time

2.4 Purely subsistence

2.5 Nothing

**3. Access to health services**

3.1 Is it easy for the family to have access to health services?

3.1.1 Yes

3.1.2 No

3.1.3 If not, why?

3.2 Who provides these services?

3.2.1 Government

**Building Community Resilience in Mine Impacted Communities**

3. 2.2 Developer

3.2.3 Churches

3.3 Did you have access to these services prior to the mining operations?

3.3.1 Yes

3.3.2 No

3.3.3 Unsure

3.4 Do you think these services will be available beyond mine closure?

3.4.1 Yes

3.4.2 No

3.4.3 Unsure

**4. CHALLENGES:** For each of the challenges below, indicate period of mining do you think this challenge will be greatest?

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
1. Lack of finances				
2. Non-availability of transport				
3. Prefer the use of traditional methods				
4. Non-availability of health services				

**Key: 1=prior to mine operations; 2= during mine operations; 3= after mine closure; and 4 = unsure**

**5. Community Capitals:** For each of the community capitals select only one response for each indicator (if ‘two or more’, indicate which two they were).

Capitals & questions	Indicators	Categories
<b>Human</b> What are your acquired qualifications and training skills?	1. Qualification of people	a. degree
		b. Diploma
		c. Certificates : year 12 & 10
		d. None
	2. Number of training courses undertaken	a. Formal from Government
		b. Mining company
	c. Spin-offs businesses	
	d. No training	
<b>Social</b> What type of community activities are you involved in?	1. Organised activities	a. Council work
		b. Church activities
		c. Youth and sports
	2. Informal community engagements	a. Subsistence agriculture
		b. Community gatherings
		c. Family meetings
<b>Financial</b> Are you formally employed?  What are the other alternatives you engage in to generate income?	1. Employment	a. Government agencies
		b. Mining company
		c. Other private employer — spin-offs businesses
		d. Unemployed
	2. Small scale businesses ( <i>SMEs — i.e. small scale mining, trade stores</i> )	a. Operating formally established business activities
		b. Selling things of economic value on irregular routines
	c. Purely subsistence	
	d. None	
<b>Built</b> What are the main support services you have in the health facilities?  How do you get to the health facilities?	1. Access to support services in the delivery of health services	a. Roads linking villages and health service
		b. Water and sewer systems
		c. Power supply
	2. Available means of transport	a. Ambulance
		b. PMV truck/bus
		d. None ( <i>walking</i> )
<b>Natural</b>	1. What natural resources do you have access to?	a. Safe drinking water sources b. Land for subsistence agriculture gardening, fishing, & hunting c. Access to mineral resources (gold and alluvial)
<b>Political</b> Is there a mechanism to contribute?  Which level of power structure did you connect more and make decisions?	1. Formal Community connections to power structure	a. Community involvement in policy making at national level b. Community involvement in decision making at the provincial level c. Local Level Government d. Village court
	2. Informal community groups	a. Women Groups b. Church Leaders c. Youth groups
<b>Cultural</b>	1. What traditional or indigenous approach do you use to heal sick people?	a. The use of herbs in healing — physical healing b. Spiritual healing — associated with religious beliefs c. Influence of customary values on healing — beliefs on illnesses

## **Appendix 7: Semi-structured interviews and purposive observations**

### **A. Government agencies**

#### **Questions**

1. How does your department support the mine impacted communities?
2. What are your policies on the delivery of health services in mine impacted communities in PNG?
3. What organisations do you work in partnership with?
4. Do you have any plans to specifically support the delivery of health services in the mine impacted communities both during and beyond mine closure?
5. Do you face any challenges with other stakeholders

### **B. Mining companies**

#### **Questions**

1. What type of health services do you provide for the communities?
2. In what ways does the government support the mining companies in the delivery of health services?
3. What are the problems with working with the other stakeholder (government, the church and others)?
4. Who does the coordination on the delivery of health services in this community?



5. Do you have any plans to specifically support the delivery of health services in the mine impacted communities both during and beyond mine closure?

### C. Mine impacted communities

#### 1. Focus groups and key informants

Capitals	Indicators	Questions
Financial	<ul style="list-style-type: none"> <li>• Compensation/ Royalty/ wages</li> <li>• Income generating activities</li> <li>• Small and medium enterprises</li> </ul>	<ul style="list-style-type: none"> <li>• Does Provincial dept. of health receive financial support from the mining company?</li> <li>• If yes, what area of health is the money spent on?</li> <li>• What are the income generating activities for the local populations?</li> <li>• What type of small scale businesses operate in mine impacted communities?</li> <li>• Where do these businesses get there supplies/customers from?</li> </ul>
Social	<ul style="list-style-type: none"> <li>• Relationships/ kinship</li> <li>• Networking of stakeholders -institutions at all levels of government ( national, provincial and local level)</li> </ul>	<ul style="list-style-type: none"> <li>• Do you use the support of your kinship/wantok network to access health services?</li> <li>• How do you use the support of your kin/ wantok to access health services/ information etc.).</li> <li>• Why/why not?</li> <li>• Does the mining company network with any organisation in the province to deliver health services?</li> <li>• If yes, what areas of health do they focus on?</li> </ul>
Human	<ul style="list-style-type: none"> <li>• Development of local population                             <ul style="list-style-type: none"> <li>• Level of education achieved</li> <li>• Skills training</li> </ul> </li> <li>• Health improvements</li> </ul>	<ul style="list-style-type: none"> <li>• Are kids better educated now than they were before the mine'? (and why or why not)</li> <li>• Are people healthier now than they were before the mine? (and why/ why not etc.)</li> <li>• Why do they think this or that'?</li> <li>• How can the health and education of local populations be improved so they can better contribute building community resilience?</li> </ul>
Political	<ul style="list-style-type: none"> <li>• Policies</li> <li>• Decision making process (participation by who at all levels of gov)</li> </ul>	<ul style="list-style-type: none"> <li>• Who makes decisions now?</li> <li>• Who made decisions in the past before the mine?</li> <li>• What say do communities have now, compared to before?</li> <li>• Who makes decisions on the delivery of health services?</li> <li>• What say do communities have in this?</li> </ul>
Cultural	Values on health problems	<ul style="list-style-type: none"> <li>• How do you treat sick people?</li> <li>• How is that different to the past?</li> <li>• How has the mine impacted on the resilience of your way of dealing with the sick? (Misima-consider all 3 phases).</li> <li>• What are some values of people on health issues?</li> <li>• What are some cultural practices use to deal with health issues?</li> <li>• Are there specific practices for specific diseases like HIV/AIDS and STIs?</li> </ul>

### Building Community Resilience in Mine Impacted Communities

Natural	<ul style="list-style-type: none"> <li>• Minerals-copper, gold, nickel</li> <li>• Geographical isolation</li> </ul>	<ul style="list-style-type: none"> <li>• How did you use the forest/ water/ garden land etc.) in the past?</li> <li>• How has the mine impacted on this resource use?</li> </ul>
Built	<p>Infrastructure</p> <ul style="list-style-type: none"> <li>• Transport system</li> <li>• Health facilities- hospitals, aid posts, equipment</li> <li>• Electronic communication systems</li> </ul>	<ul style="list-style-type: none"> <li>• What are some current/available health services?</li> <li>• How do people gain access to these services (bus, pmv, boat, plane etc.)</li> <li>• How accessible are the communication facilities?</li> <li>• Do the health facilities have appropriate equipment to deal with diseases?</li> </ul>

#### Guidelines for purposive observations

The purposive observations were targeting the means of transport people used to come to the health facilities.

## Appendix 8: Lihir MoA on health services

MEMORANDUM OF AGREEMENT RELATING TO THE

HEALTH SERVICES ON LIHIR ISLAND

BETWEEN THE INDEPENDENT STATE OF PAPUA NEW GUINEA

AND

NEW IRELAND INTERIM PROVINCIAL GOVERNMENT

AND

NIMAMAR DEVELOPMENT AUTHORITY

AND

THE CATHOLIC CHURCH HEALTH AGENCY

AND

THE LIHIR MANAGEMENT COMPANY PTY LIMITED

ZACCHARY G GELU

STATE SOLICITOR

STATE SOLICITOR'S OFFICE  
DEPARTMENT OF ATTORNEY –GENERAL  
P O BOX 691  
WAIGANI  
PAPUA NEW GUINEA  
REF: TD 96/3 (F.M.L)

**THIS AGREEMENT is made the 25<sup>th</sup> day of May 1996**

**BETWEEN: THE INDEPENDENT STATE OF PAPUA NEW GUINEA**

**(hereinafter called “the State”) of the first part;**

**AND : NEW IRELAND INTERIM PROVINCIAL GOVERNMENT**

**(hereinafter called “the Interim Provincial Government” of the  
Second part;**

**AND : NIMAMAR DEVELOPMENT AUTHORITY** (hereinafter referred to as “**NDA**”) of  
the **third** party;

**AND : THE CATHOLIC CHURCH HEALTH AGENCY** (hereinafter called “the Catholic  
Church”) of the **fourth** part;

**AND : LIHIR MANAGEMENT COMPANY PTY LIMITED OF 7<sup>TH</sup> Floor Pacific Place,  
Cnr Champion Parade and Musgrave Street, Port Moresby** (hereinafter referred to as  
'LMC') of the other part;

**WHEREAS:**

- A. The State, the Interim Provincial Government, LMC, NDA and the Catholic Church  
have agreed in principal for an integrated Medical Facility to be built at

Londolovit on Niolam in the New Ireland Province to serve both mine employees and other residents of the Lihir Group of Islands.

- B. LMC will construct manage and staff the Medical Facility at Londolovit and all health services to be provided at the Medical Facility will be provided and administered by LMC.
- C. The Interim Provincial Government and NDA will be responsible for Government Health Facilities on the Lihir Group of Islands which shall include all of the aid posts and Masahet Sub Health Centre on Masahet Island and any other additional Government Health Facilities.
- D. The Catholic Church will continue to be responsible for running Palie Health Centre in particular the Maternal Child Health Programme with the normal financial assistance from the Interim Provincial Government.
- E. The State desires such services referred to in A and B above to be provided continuously for the people of the Lihir Group of Islands and has agreed to provide financial support to assist LMC in maintaining such services upon the terms and conditions herein contained.

NOW IT IS HEREBY AGREED as follows:

## 1. DEFINITION

In this Agreement, unless the contrary intention appears:-

- (a) **“Company”** means the Lihir Management Company Pty Limited, which has been appointed by Lihir Gold Limited to manage the Lihir Gold Project on its behalf;
- (b) **“Department”** means the Department of Health of the State or such other Department within the State as

shall be responsible from time to time for the provision of health services to the people;

- (c) **"Government Health Facilities"** means the Health Facilities run, operated and funded by the Interim Provincial Government or NDA on the Lihir Group of Islands;
- (d) **"Lihir Group of Islands"** means the group of islands comprising of Niolam, Sanambiet, Malie, Masahet and Maur.
- (e) **"Medical Facility"** means -the Medical Facility to be constructed by LMC at Londolovit on Niolam in the New Ireland Province and includes the buildings and other associated fixtures to be located at Londolovit which facility is more particularly described in the ground plan annexed hereto as Annexure "B".
- (f) **"Medical Officer-Incharge"** means a qualified doctor who meets the requirements of the Papua New Guinea Medical Board, including being registered as a medical practitioner in PNG, employed by LMC to run the Londolovit Medical Facility;
- (g) **"Secretary"** means the permanent head of the national Department of Health and includes such person as may be acting in that position and any person authorised by the Secretary to exercise his powers and functions hereunder except the power of delegation;
- (h) **"Service"** means the services to be rendered by LMC pursuant to this Agreement as specified in Clauses 2 and 3 hereof;
- (i) **"Stall"** means the personnel (having appropriate qualifications) specified in Clause 5 hereof;
- j) Monetary references are references to Papua New Guinea currency unless otherwise specifically expressed;

k) The headings do not affect the interpretation or construction of this Agreement.

l) Words importing the singular includes the plural and vice versa;

m) Words importing any gender include the other gender;

n) References to a Recital, Clause or Schedule are to a Recital, Clause or Schedule or part thereof this Agreement.

## 2. **Service**

1.1 LMC shall, in consultation with the Department of Health, provide all the health services required (or necessarily required) at the Medical Facility according to standard government policy and standards as determined by the Department.

1.2 LMC shall be solely responsible for the administration and the ongoing maintenance of the Medical Facility to be constructed by it under the terms of this agreement.

1.3 The services required to be rendered by LMC pursuant to this Agreement shall include regular medical visits, varied out on a rotational basis by the two medical officers resident at the Medical Facility to other medical facilities namely Palie Health Centre, Masahet Health Centre and the aid posts on the Lihir Group of Islands. The medical visits will be on a basis agreed between LMC and the Sub-District Health Co-ordinator, in consultation with the District Health Co-ordinator, in co-ordinator based in Namatanai.

## 2. RANGE OF SERVICES AT THE MEDICAL FACILITY

- 2.1 **LMC** shall provide on behalf of the State and the Interim Provincial Government a comprehensive range of health services in conformity with the State's National Health Policy and sound medical practices.
- 2.2 **LMC** shall provide a referral and emergency services for other medical facilities on the Lihir Group of Islands.
- 2.3 **LMC** shall maintain a bulk medical supplies store at the Medical Facility which shall cater for the needs and requirements of the Medical Facility and other medical facilities in the Lihir Group of Islands.

### 3. ADMINISTRATION AT THE MEDICAL FACILITY

- 3.1 LMC shall have full authority and control in the management administration and implementation of the Services at the Medical Facility and may exercise such as authority and control through the Medical Officer In-Charge of the Medical Facility.
- 3.2 The Medical Officer In-Charge of the Medical Facility shall provide all management and clinical reports as required by the Department of Health to all relevant government agencies, in the format required by the Department.

### 5. GOVERNMENT HEALTH FACILITIES

- 5.1 The Interim Provincial Government shall be responsible for providing staff, supplies and supervision for Government Health Facilities on the Lihir Group of Islands to a level at least equivalent to the rest of the New Ireland Province.
- 6.2 NDA shall be responsible for the funding, maintenance and upgrading of all Government Health Facilities for the Lihir Group of Islands.



- 5.3 NOA shall be responsible for the expansion and development of existing Government Health Facilities and new community health facilities to meet the needs of the Lihir people over time.

## 6. FINANCE

6.1 The State shall provide funding not exceeding K440, 000 as its share of the capital costs of the additional facilities required for an integrated Medical Facility but not covered under the Lihir Joint Ventures feasibility study. A breakdown of these requirements is annexed hereto as Annexure "A".

A payment of K220, 000 will be made by the State at the commencement of construction of the Medical Facility. A full and final payment of K220, 000 will be made on completion of the Medical Facility.

6.2 The State through the Department of Finance, shall pay its share of the Medical Facility operational costs of K150, 000 annually directly to LMC. This payment will be made in advance before the commencement of each financial year.

6.3 Annexure "A" of the various memorandum of agreements entered into between the Provincial Government, NDA and the Lihir Mining Area Landowners Association, which sets out the component of the capital cost to be borne by the State is now superceded by Annexure "A" of this agreement, which sets out the total cost and additional cost to be incurred as a result of the decision to build an integrated Medical Facility.

6.4 The payments made under Clause 6.2 shall be cumulatively increased annually beginning within a year of the Commercial Production, for the term of the Special Mining Lease NO.6, by the percentage increase in the Annual Consumer Price Index (all centres).

6.5 LMC shall submit to the State within six months of the completion of the construction of the Medical Facility a report

on the expenditure on the Medical Facility.

6.6 The Schedule of Fees for medical services as approved by the State, Will be charged by LMC to all recipients of Services at the Medical Facility.

6.7 The Fees charged as per Clause 6.6 will be retained by LMC.

## **7. EQUIPMENT AND SUPPLIES AT THE MEDICAL FACILITY**

7.1 LMC shall be responsible for providing all the equipment and medical supplies to be installed in or required at the Medical Facility.

7.2 LMC shall also be responsible for the maintenance upgrading and replacement over time of the equipment installed at the Medical Facility.

7.3 The State shall extend to LMC the right to obtain medical supplies for the Medical Facility from the government base medical stores on the same terms and conditions as other government medical facilities, including any necessary registration of the Medical Facility.

7.4 The Department shall facilitate the registration of the Medical Facility as an agency to bulk order medical supplies from the government base medical stores for the purposes of supplying the needs of the Medical Facility and other medical facilities in the Lihir Group of Islands.

## **8. DURATION OF AGREEMENT**

8.1 This Agreement shall be effective as of the date of execution and shall continue in force until its expiry, which shall be the expiry date of the term of the Special Mining Lease No.6, or its earlier termination in accordance with Clause 9 hereof.

8.2 This Agreement shall be reviewed every four (4) years from the effective date of this agreement.

9. **TERMINATION**

This Agreement may be terminated;

- (a) by either party giving to the other twelve (12) months' notice in writing to that effect; or
- (b) upon the expiry on the expiry date of the Special Mining Lease

No.6.

10. **NOTICE**

Any notice or other communication made, given or sent by one party to the other pursuant to or in relation to this Agreement shall be deemed to have been duly made, given or sent if it is in writing and signed (for the State by the Secretary for the Department of Health and for the Interim Provincial Government by the Administrator or the Interim Governor and for LMC by its General Manager and for NDA by its Chairman and for the Catholic Church by its Health Secretary and delivery by hand or sent by prepaid post:-

- (a) For the State:

The Secretary

Department of  
Health PO BOX  
3991

HOHOLA NCD

- (b) In the case of the Interim Provincial

Government:

The Administrator  
New Ireland Provincial Administrative Headquarters  
PO Box 103  
KAVIENG  
  
New Ireland Province

- (c) In the case of NDA:

The Chairman  
Nimamar Development Authority  
Potzlaka Government Station  
Lihir Island  
New Ireland Province

- (d) In the case of the Catholic Church:

The Health Secretary  
Catholic Health Agency  
PO BOX 49  
KAVIENG  
New Ireland Province

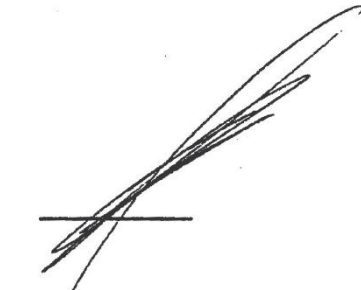
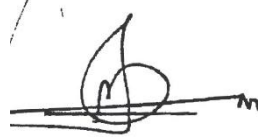
- (e) In the case of LMC:-

Lihir Management Company Pty Limited  
7<sup>th</sup> Floor, Pacific Place,  
Cnr Champion Parade and Musgrave Street,  
P O BOX 789  
PORT MORESBY  
National Capital District

IN WITNESS WHEREOF this Agreement has been executed on the day and year first above mentioned.

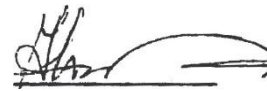
SIGNED for and on behalf of THE INDEPENDENT STATE  
THE INDEPE-----PAPUA NEW GUINEA )  
NEW C----- )  
M by HON. CHRIS HAIVETA MP) )  
Minister for Finance )  
 \ . ' . )  
 ----- )

SIGNED for and on behalf of )  
the NEW IRELAND INTERIM )  
PROVINCIAL )  
GOVERNMENT )  
by the Interim Governor C; )  
in th presence of: )  
 )

Pamangau  
Witness

SIGNED for and on behalf )  
Of NIMAMAR DEVELOPMENT )  
AUTHORITY' by the - )  
Chairman in the presence )  
of: )  
 )  
 )  
 )



.....  
Witness

: 11 :

**SIGNED** for and on behalf )  
of the **CATHOLIC CHURCH HEALTH** )  
**AGENCY** by )  
the Health Seceratry in the )  
presence of: )

+ *Antonia Kipsanika*

*[Signature]*  
.....  
Witness

**SIGNED** by the )  
**LIHIR MANAGEMENT COMPANY PTY** )  
**LIMITED** for and on behalf )  
of **LIHIR GOLD LIMITED** )  
in the presence of )

*[Signature]*  
.....

*[Signature]*  
.....  
Witness

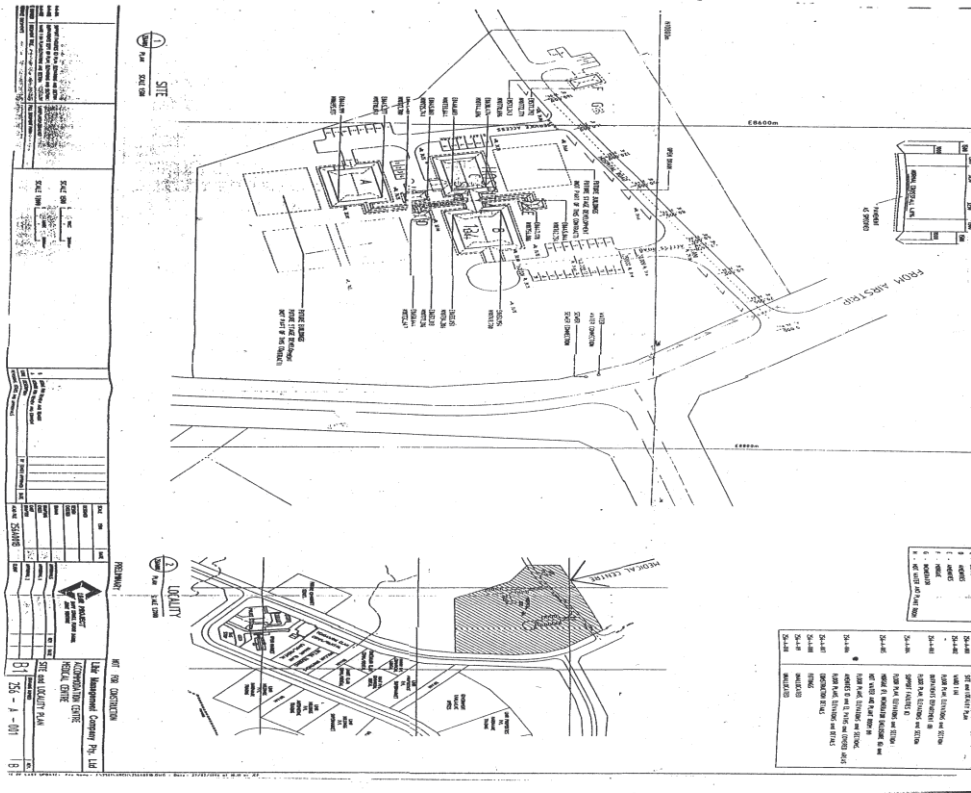
**ANNEXURE "A"**

Lihir Project  
Landolcnit Integrated Medical Facility  
Capital Coat

		Total Facility	Public Facilities	
		<u>Otv</u> PGK000's	<u>Otv</u> POK000's	
<b>Building</b>				
<b>&amp;</b>				
Ward 1	- Total building	274 sm	325	
	- Public Male			41 sm
	- Public female/peadiatrics			40 sm
	- Nurses station			5 sm
	- Delivery			32 sm
Outpatients	- Total building	334 sm	397	
	- Public office/records			19 sm
	- Sterile			10 sm
	- Public reception/admin			25 sm
	- Public consult/treatment			46 sm
	- Public consult/Occ Health			22 sm
Support facilities	- Total building	214 sm	254	
	- Laboratory			34 sm
	- Phannacy			33 sm
Amenity buildings		58 sm	80	29 sm
Covered walkways & awnings		395 sm	123	50 sm
Morgue		48 sm	30	48 sm
Incinerator & services store		45 sm	20	- sm
Furnishings incld beds		1 lot	166	1 lot
Medical equipment		1 lot	538	1 lot
Office equipment		1 lot	26	1 lot
Computer equipment		14 ea	128	6 ea.
1 years operations spares		1 lot	9	1 lot
Medical facility site development incid services		1,368 sm	376	445 sm
Ambulance Oong wheel base 4WD vehicle)		2 ea	113	1 ea
Staff housing (HSS size)		3 ea	210	3 ea
	<b>Total Facility PGK000's</b>		<b>2,816</b>	<b>1,194</b>

ANNEXURE "B"

Ground Plan  
of



Integrated Medical Facility



p.1

Appendix 9: The Misima MoA'

MEMORANDUM OF AGREEMENT RELATING TO THE

MISIMA GOLD MINING PROJECT

BETWEEN THE INDEPENDENT STATE OF PAPUA NEW GUINEA

~~THE MISIMA LANDOWNERS~~

This is the ~~Architecture~~ marked *Map 1*  
 and referred to in the affidavit of *Stanley Neger*  
 sworn on the *24* day of *March* 200*0*

The  
 of

*[Signature]*  
 Depoent

*[Seal]*  
 The  
 of

ROBERT N IRUNG  
 ACTING STATE SOLICITOR  
 DEPARTMENT OF ATTORNEY GENERAL  
 P O WARDS STRIP  
 WAIGANI

AND

p.2

Ref: TO 90/2

DATED: 08 AUGUST  
1990

<b>NO:</b>	<b>PART A-GENERAL</b>	<b>PAGE</b>
	<b>1. DEFINITIONS</b>	
	02	
	<b>2. INTERPRETATION</b>	
	02	
	<b>PART B-NATIONAL GOVERNMENT GOVERNMENT'S UNDERTAKINGS</b>	
	<b>3. SPECIAL SUPPORT GRANT</b>	
	02	
	<b>4. EQUITY</b>	
	04	
	<b>5. ROYALTIES</b>	
	08	
	<b>6. LONG TERM ECONOMIC DEVELOPMENT AND MAINTENANCE</b>	
	09	
	<b>7. ENVIRONMENT ISSUES</b>	
	09	
	<b>8. INFRASTRUCTURE DEVELOPMENT AND MAINTENANCE</b>	
	09	

**9. LOCAL BUSINESS DEVELOPMENT**

**10**

**10. TRAINING AND LOCALIZATION**

**12**

**11. POST AND TELECOMMUNICATION**

**13**

**12. ELECTRICITY**

**13**

**13. FINANCIAL ASSISTANCE TO THE LANDOWNERS**

**14**

**14. NATIONAL GOVERNMENT TO CO-OPERATE AND ASSIST**

**14**

**PART C-LANDOWNERS' UNDERTAKINGS**

**14**

**15. LANDOWNERS TO CO-OPERATE**

**14**

**16. LANDOWNERS TO CONSULT**

**15**

**PART D-FORMAL CLAUSES**

**17. LAW APPLICABLE**

**15**

**18. FORCE MAJEURE**

**16**

**19. TERMINATION REVIEW**

17

**20. RESOLUTION OF DISPUTES**

17

**21. ARBITRATION**

17

**22. WAIVER**

17

**23. SEVERABILITY**

18

**24. FURTHER ACTS**

18

**25. IMPLEMENTATION**

18

**26. REPRESENTATION AND WARRANTIES**

18

**27. COMMUNICATIONS**

19

**28. CONSULTATION**

19

THIS AGREEMENT IS MADE on the 17<sup>th</sup> day AUGUST 1990

BETWEEN: THE INDEPENDENT STATE OF PAPUA NEW GUINEA (hereinafter called the "State" of the "National Government" interchangeably) of the

AND : THE SPECIAL MINING LEASE LANDOWNERS by their respective Agents (hereinafter called the "Landowners") and the MISIMA TOWOHO SIUN ASSOCIATION which is the Landowners' Association registered under the laws of Papua New Guinea collectively of the other part.

WHEREAS

- (A) The State has entered into a Mining Development Agreement with Misima Mines Pty Limited dated 17<sup>th</sup> day of December 1987 pursuant to which mining operation is being carried out on Misima Island in Milne Bay Province.
- (B) It is recognised that the Misima Mine Project should proceed for the common benefit of the people of Papua New Guinea, and in particular-the people of the Milne Bay Province and the Special Mining Lease Landowners.
- (C) The National Government acknowledge and recognizes the needs aspirations and desires of the Landowners to receive more equitable share of benefits from mining operation carried out on their land.
- (D) The National Government, Provincial Government and the Landowners of the Special Mining Lease have therefore conducted discussions and negotiations on various matters and have agreed on a number of matters in

related agreements between each Governments and representatives of the Special Mining Lease Landowners.

(E) The National Government has, in recognition of the need for proper administration and development of the Misima District agreed to a number of matters which will directly or indirectly

(F) assist the landowners in the District and in recognition therein, the Parties hereto therefore wish to make the decisions emanating from the discussions and negotiations into an enduring Agreement.

IT IS HEREBY AGREED between the Parties as follows:-

## PART A-GENERAL

### 1. DEFINITIONS

In this Agreement, unless the context otherwise require:

“Approved Proposals for Development” shall have the same meaning as defined in the Mining Development Agreement between the State and the Misima Mines Pty Limited.

“Infrastructure” shall include social and economic facilities such as roads, hospitals, high schools and wharves.

“Mining Development Agreement” means the agreement executed between the State and Misima Mines Pty Limited for the Project dated 17<sup>th</sup> day of December 1987.

“Misima District” means the administrative district defined by the Milne Bay Provincial Government.

“Misima Mine Project” means the mining project approved by the National Executive Council over which the Misima Special Mining Lease had been granted.

“National Government” means the Independent State of Papua New Guinea.

“Parties” or “Party” means the parties to this Agreement.

p.6

“Project” means the Misima Mine Project.

“Provincial Government” means the Milne Bay Provincial Government.

“Royalty” means the royalty paid pursuant to Section 105 of the Mining Act (Chapter 195) or any amendments to, or provisions succeeding or substituted for that provision.

“Special Mining Lease Landowners” means citizens who are members of clans that own land according to custom in the Special Mining Lease.

## 2. INTERPRETATION

In this Agreement, unless the context otherwise require:

- (a) The headings herein do not affect the Interpretation or construction of this Agreement;
- (b) Reference to any legislative act includes the amendments to that act for the time being in force and also to any act passed in substitution therefore and any regulations for the time being in force thereunder;
- (c) words importing any gender include the plural and vice-versa;
- (d) words importing any gender include the other gender; and
- (e) the recitals form part of the Agreement.

## PART B-NATIONAL GOVERNMENT'S UNDERTAKINGS

### 3. SPECIAL SUPPORT GRANT

The National Government shall use its best endeavour to ensure that at least 20% of the Special Support Grant paid to the Provincial Government is made available for use in the Misima District.

### 4. EQUITY

4.1 The National Government undertakes that the Landowners through a properly constituted and representative corporate body (hereinafter called the landowners company) will have the



option to take up to 25% of the State's 20% equity in the Project in accordance with the scheme provided herein (that is 5% of the total equity of the project).

4.2 Upon the Landowner's decision to exercise the option to take up 25% of the State's 20% equity in the Project, the following criteria shall apply;

- (a) Mineral Resources Development Company Pty Limited (MRDC) will incorporate a Subsidiary Company ("the Subsidiary") and shall transfer to the Subsidiary the State's 20% interest in the Project which it now holds on behalf of the State; and
- (b) MRDC upon incorporation of the Subsidiary will extend the following options to the Landowners to acquire shares in the Subsidiary, such of which shall be implemented at the Landowners' election:
  - (i) within two (2) months from the date of exercise of the option, 1-25% of Subsidiary's shares will be made available by the State to the Landowners (the First Option).
  - (ii) within one (1) year from the date of exercise of the option, a further 11% of the Subsidiary's Shares will be made available by the State to the Landowners (the Second option).
  - (iii) during the period of one (1) month following the fifth (5) anniversary of the exercise of the option, a further 12.76 % of the Subsidiary's Shares will be made available by the State to the Landowners (the Third Option).

4.3 The cost of the Shares will be met as follows:

- (a) The First and the Second Option Shares will be sold to the Landowners at the relevant percentage of the cost incurred by MRDC

in acquiring the 20% interest in the Project plus the relevant percentage of all interest and charges incurred by MRDC in acquiring the 20% Interest in the Project plus the relevant percentage of all interest and charges incurred by MRDC in borrowing moneys to fund the acquisition of its interest in the Project; and

- (b) The Third Option Shares will be sold to the Landowners at the then fair market value as determined by an independent expert acceptable to the Parties or if the Parties cannot agree, and expert appointed by the President of the PNG Society of Accountants.

4.4 The Shares will be purchased in the following manner:

- (a) For the First and Second Option Shares, the amount paying as set out in Clause 4.3 (b) herein will be deemed to be an interest free loan from MRDC to the Landowners which the Landowners will repay out of their share of dividends payable by the Subsidiary; and
- (b) For the Third Option Shares, the Landowners will pay cash within three (3) months from the date of determination of the fair market value of the Shares. If payment is not made within this time frame, the Option will lapse;

4.5 MRDC will lend moneys to the Subsidiary to enable the Subsidiary to meet its share of cash calls made by Misima Mines Pty Limited to meet its expenses, however, MRDC will not be responsible for landing moneys to the Subsidiary in respect of cash calls relating to the percentage of shares acquired by the Landowners pursuant to the Third Option which shall be the responsibility of the Landowners. The loans, together with all interest and charges incurred by MRDC in borrowing these moneys will be repaid by the Subsidiary to MRDC in absolute priority to all other obligations of the Subsidiary, such of which will be secured. No dividends will be payable by the Subsidiary until these loans plus interest and charges have been repaid in full.

4.6 So long as any loans interest and charges referred to in Clause 4.5 herein remain outstanding the control of the Board of Directors and the Management of the Subsidiary shall remain with MRDC.

4.7 The Shares will be assigned in the following manner:

(a) In relation to the First Option-upon exercise of the Option;

(b) In relation to the Second Option-upon repayment to MRDC in accordance with Clause 4.4 (a) herein.

(c) In relation to the Third Option-upon payment for the Shares in accordance with Clause 4.4 (b) herein.

4.8 Company shall hold:

(a) All the Shares acquired under the First and the Second Option in trust for the Landowners and shall not sell the Shares during the life of the Project.

(b) All the Shares acquired under the Third Option, but the Shares may be resold at the Landowners' option at the then market value to the following entities or person(s), in the preference herein listed:

(i) Firstly to MRDC;

(ii) Secondly to Place Pacific Pty Limited; but

(iii) If neither the MRDC nor Placer Pacific Pty Limited wish to purchase the Shares, then to

any other person (s)

4.9 The Landowners hereby acknowledge that if they, through the Landowners' Company exercise the option to take up Shares in the Subsidiary, then they will be bound by all the rights and obligations associated with the Shares and which apply to the Subsidiary Company as

a result of its participation as a shareholder in the Project. The State through MRDC and the Subsidiary will give such notice, prior to the Subsidiary entering into any agreements which might affect the Landowners equity participation in the Project. The State through MRDC and the Subsidiary will give such notices, prior to the Subsidiary entering into any agreements which might affect the Landowners equity participation in the Project.

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## 5. ROYALTIES

5.1. The National Government will pay all royalties from mine products from the Government and hereinafter undertakes to ensure that the Provincial Government distributes at least 30% of the royalty, as agreed to between the Provincial Government and the Landowners to the Landowners in the following manner:

5.2.

(a) 10% directly to the Special Mining Lease Landowners; and

(b) 20% to an investment fund to be established by the National Government for the benefit of the future generations of the Special Mining Lease Landowners.

5.2 For the purpose of administration of investment of moneys from the trust fund, the National will appoint an Investment Advisory Committee whose membership shall include a representative of the Landowners.

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NAROKOBI LAWYERS

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IN WITNESS WHEREOF the Parties hereto have executed and delivered this Agreement in Papua New Guinea the day and year first above written.

SIGNED for and on behalf of the INDEPENDENT STATE OF PAPUA NEW GUINEA by the Prime Minister the Right Honourable RABBIT L. NAMALILI GNG, MP.

*[Handwritten signature]*

In the presence of:

*[Handwritten signature]*

WITNESS

The COMMON SEAL of the MISIMA TOWOHO SIUN ASSOCIATION was affixed by: *[Handwritten signature]* with the Authority of the Misima Towoho Siun Association in the presence of:

*[Handwritten signature]*

*[Handwritten signature]*

WITNESS



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