Working together as one?

Exploring the implementation and community perceptions of catchment management in Samoa

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Abstract

Water is a constantly changing resource by way of the hydrological cycle. It is unevenly distributed and crosses boundaries of all kinds i.e. political, social, cultural and natural.

Samoa is a small developing state in the Pacific Region that is facing rapid pressure with its water resource availability. Consequently, access to and use of water resources has created tensions between water resources regulators, water utilities and villages. Therefore, managing and governing of water becomes a challenging process that has to take into account the complexity of both nature and society. With the emergence of the Integrated Water Resources Management (IWRM) framework, a greater social acceptance and importance has been given to catchment scale management and governance. Nowadays, many countries including Samoa, have embraced this appealing concept where catchments are seen as natural units for water governance and management.

This study used a social qualitative approach, aimed to investigate the implementation of catchment management and examine local community perceptions of catchment management, using Apia Catchment as case study. It is based on a conceptual framework of the concept of scale i.e. set out in recent debates and ideas in the arena of catchment scale water governance and management. The primary data was collected from community focus groups within two villages of Apia Catchment, and semi-structured interviews with government agencies involved in the Water and Sanitation Sector programmes.

The findings revealed a shift in water resources management and governance and a spatial scale mismatch in Apia Catchment management. According to government officials, the catchment approach is a 'management tool' adopted to improve the coordination between water users and to promote local ownership of catchment activities amongst individual villages. However, several challenges arose around land ownership, monetary cost, community resistance and issues outside of catchment areas when implementing catchment management. Despite the challenges that government officials encountered and the concerns raised by the communities, catchment scale management is still being adopted in Samoa. With the adoption of catchment management, many individual villages within Apia Catchment are expected to make decisions collectively. However, some local groups have concerns about the use of the term 'boundary', the possibility of the government taking over their land and the proposed catchment-based authority taking precedence over pre-existing cultural hierarchy.

Overall, this research reveals that catchment management is often viewed or seen by government as a 'one size fits all' notion that ignores the range of the socio-ecological realities on the ground. This study shows that in order to design better water resources policies and strategies that are fully applicable and workable for Samoa, it is very important to identify these mismatches in scales (e.g. spatial and administrative) and levels (e.g. national and local). Understanding scales and associated levels is critical to understanding the whole system and can reduce possible consequences of mismatches due to lack of interaction and collaboration between levels and scales. Local villages have expressed their opinions on how to enhance catchment management and this could perhaps be useful for government in terms of implementation. Based on the results, recommendations are made for water resources managers to assess the importance of different levels and their interactions but, more importantly, to consider how local communities perceive catchment management.

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List of Acronyms

ADB	Asian Development Bank
CC	Catchment Committees
DAFF	Department of Agriculture, Forestry and Fisheries
EPC	Electric Power Cooperation
EU	European Union
GoS	Government of Samoa
GWP	Global Water Partnership
GEF	Global Environment Facility
IWRM	Integrated Water Resources Management
IWSA	Independent Water Schemes Association
MAF	Ministry of Agriculture and Fisheries
MoF	Ministry of Finance
MoH	Ministry of Health
MNRE	Ministry of Natural Resources and Environment
MWCSD	Ministry of Women, Community and Social Development
MWTI	Ministry of Works, Transport and Infrastructure
NWRS	National Water Resources Strategy 2007-2017
NGO	Non-Government Organisation
PRAP	Pacific Regional Action Plan on Sustainable Water Management
RBO	River Basin Organisation
SOPAC	Pacific Islands Applied Geoscience Commission
SOE	State Owned Enterprises
SWA	Samoa Water Authority
UNDP	United Nations Development Programmes
UNEP	United Nations Environment Programmes
WaSSP	Water Sector Support Program
WRD	Water Resources Division
WSCU	Water and Sanitation Sector Unit
WRMB	Water Resources Management Board
WMP	Watershed Management Plan

Chapter 1 – Introduction

1.1 Introduction

Water affects everyone. Catchment, watershed and river basin[1] are terms that are used interchangeably by water resource managers and planners to define "areas of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course" (USEPA, 2012, "Watershed", para. 2). These naturalistic boundary-defining concepts have been enshrined in what is known as Integrated Water Resource Management (IWRM). This global paradigm of catchment scale management has evolved from its early conception in the eighteenth century in its introduction into the water policies of European countries to re-emerge in the 1990s as a cornerstone of the IWRM framework (Molle, 2009). Nowadays, globally, many institutions, government agencies and organisations have embraced this concept and emphasise that IWRM should be carried out at the level of the basin or catchment (Global Water Partnership [GWP], 2000; United Nations Environment Programmes [UNEP], 2012). It has fostered considerable social acceptance for the catchment scale as the natural unit for water governance, planning and management (Molle, 2006; Smedley & Rowntree, 2012).

In light of such optimistic claims, it is necessary to pause and ask, how does this apparently universally-appealing catchment approach and management work in different social, economic and political contexts? It is also necessary to ask: how do communities interact within and perceive the catchment scale water governance and management approach? This research uses a conceptual framework centred on the concept of scale to address these questions. It focuses on how catchment boundaries have been applied and used in water governance and management in Samoa. According to Kerr (2007) and Swallow, Garrity, and Van Noordwijk (2002) catchments or river basins are useful hydrological units but are not natural units of human social systems. Similarly, Cumming, Cumming and Redman, (2006) argue that many of the problems encountered by societies in managing natural resources arise because of a mismatch between the scale of management and the scale of the ecological processes being managed. Cohen (2012) argues that just as jurisdictional boundaries have 'pros' and 'cons' so too do catchment boundaries. Other authors emphasise that although IWRM aims to have a more synchronized and integrated management of water related issues, such as water quality and land management, there are still cross-cutting issues such as climate change which have inseparable implications on catchments or river basins (Gain, Rouillard, & Benson, 2013).

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[1] Catchment, watershed and river basin are similar terms and are used interchangeably in broader literature and within this thesis. Although in some studies the terms are used depending on the sizes of the areas, such as catchment for smaller areas within river basin.

As stated earlier, although it makes sense to manage water resources based on hydrologic boundaries due to their apparent natural character as a unit or a connected system, these boundaries do not usually align with the socially, culturally and politically constructed boundaries of communities and their social practices.

Catchment or watershed related projects were implemented across the Pacific Region including Samoa in the 1990's, but it was not until 2002 that the IWRM framework and its principles were formally recognized through the formulation and endorsement of the Pacific Regional Action Plan on Sustainable Water Management (Pacific RAP). It was presented at the Third World Water Forum convened in 2003 in Kyoto, Japan (Carpenter & Jones, 2004).The Pacific RAP has a strong focus on integrated water resources management and specifically identifies IWRM as a "solution to managing and protecting water resources, improving governance arrangements and therefore improving water supply and sanitation provision" (Pacific Islands Applied Geoscience Commission [SOPAC] ,2007b, p. 5). Due to the limited resources available, Samoa, has relied on overseas countries and international organisations such as the European Union (EU), the United Nations Development Programmes (UNDP) and the Global Environment Facility (GEF) for support to assist in water resources management projects. IWRM approach is a cornerstone of these aids, financial subsidies and funding conditions that the Government of Samoa (GoS) has adopted. Deployed in the IWRM approach it sees water resources managed along catchment boundaries. The GoS has adopted catchment-based approach in hope for a better management of the islands' water resources.

1.2 Purpose of the study

The aim of this research is to investigate how catchment boundaries have been applied and used in water governance and management in Samoa and examine community perceptions of catchment management using Apia Catchment as case study.

Research objectives are as follows:

1. review government reports, policies, plans and documents as well as conducting semi-structured interviews with government ministry participants to examine how the catchment scale model has been adopted and implemented in Samoa.

2. develop a conceptual framework that draws on the concept of scale.

3. conduct community focus groups to explore how target groups understand and interact with catchment scale water management.

4. make recommendations based on research findings to propose mechanisms to address challenges that arise from the research for future implementation.

The research questions that have guided the research are:

1. How have catchment boundaries and approaches been adopted and applied in water governance and management in Samoa?
2. How do communities in the Apia Catchment perceive, interact with and contest these catchment boundaries and approaches?
3. What are the challenges that arise from or for the current implementation of catchment management in Apia Catchment and more broadly in Samoa?

1.3 Scope of the study

The scope of this research is limited to Samoa and specifically to Apia Catchment. However, the results of this research can be applied to other countries with similar issues in terms of catchment scale water governance and management. This research is not a bio-physical assessment of the Apia Catchment; neither does it provide an in-depth analysis of issues such as water quality or quantity that are typically associated with the catchment nature ecosystems status. In addition, the water supply developments, piping systems and infrastructures are not discussed or within the scope of this research. Nonetheless, the focus of this study is the social dimensions of catchment scale water resources governance and management.

1.4 Thesis Structure and Outline

Chapter 2 provides background for the research with an overview of Samoa's geographic and demographic information followed by its history and a brief summary of its land tenure system. More broadly this chapter deals with the history of water resources management and governance in Samoa both in the past and the current situation. Chapter 3 sets out the conceptual framework. This includes a literature review on catchment approach and how has emerged as the cornerstone of water resources management and governance in Samoa. It is followed by a review of academic literature on the concept of scale and how it is used in different disciplines related to water resources management. Chapter 4 outlines the methodology that has been used in this research and provides overview of research methods, ethical considerations and recruiting of participants. The results of this research are presented in Chapter 5 (Part 1) and Chapter 6 (Part 2). Chapter 5 outlines findings from semi-structure interviews with government officials and document analysis. Chapter 6 outlines community perceptions from the two villages of Apia Catchment. Chapter 7 discusses the results and links these to the conceptual framework and further relates it to Samoa's water resources management and governance. Chapter 8, the conclusion, summarises the research findings and makes recommendations for government agencies involved in water governance and management. I also reflect on the challenges of this research and make recommendations for possible future research.

Chapter 2 – Background and Context

2.1 Introduction

This chapter presents background information on Samoa in terms of its geography, environment, people, political systems and land resources. It also presents a brief overview of water resources management i.e. the changes and current frameworks that have been adopted and implemented in the Water and Sanitation Sector (hereinafter referred to as the Sector) that have shaped the management and governance of water resources in Samoa. Subsequently, I highlight several challenges that have affected the sustainable management of water resources in Samoa.

2.2 The Islands of Samoa

Samoa is a small country in the Pacific Region which consists of ten islands; two big islands, namely Upolu and Savai'i. They are the most populated islands with six other smaller uninhabited islands. The country's capital city is Apia, located on the highest populated and the second largest island of Upolu. The nearest developed countries are New Zealand and Australia (Figure 2-1).

Figure 2-1- Map and location of Samoa
Source: http://www.lib.utexas.edu/maps/samoa.html

2.2.1 Geography, Climate and Natural Disasters

Samoa has a geographical terrain of narrow, coastal plains with volcanic, rocky and rugged mountain interiors. The island has a total land area of 2,831 square kilometres with the highest peak Mount Silisili, being 1,848 metres high on the island of Savai'i. The country has two seasons, namely, dry from May to October and wet from November to April. The islands have an annual rainfall of about 3,000 mm varying from north-west parts of the islands to over 6,000 mm in the high areas (Ministry of Natural Resources and Environment [MNRE], 2013). As a small island, with limited land mass and freshwater resources, the pressure of climate conditions associated with the risk of climate change make Samoa highly vulnerable to natural disasters. The country has a history of natural disasters, to name a few: tropical cyclones Ofa in 1990, Val in 1991, Heta in 2004. Also, in the tsunami tragedy of September 2009, 147 people were killed; there was devastation to the whole country (MNRE, 2013; Pacific Islands Applied Geoscience Commission [SOPAC], 2010). The most recent natural disaster was cyclone Evan which hit Samoa in December 2012 and caused massive damage and with losses estimated at SAT$235.7million, equivalent to US$103.3million (Government of Samoa, 2013). These climate-related natural disasters have caused widespread impacts on the population, economy and natural resources.

2.2.2 People, Culture and Christianity

The population of Samoa is approximately 187,820 people. Approximately 76 per cent live on Upolu Island, of that 76 per cent; 20 per cent live in or around the capital of Apia while 56 per cent live in rural areas of Upolu. Savai'i accounts for 24 per cent of the total population (Samoa Bureau of Statistics, 2011). The population is mixed, with Asians, Indians, half-European-Samoans with full-blooded Samoans accounting for over 90 per cent of the population. According to the 2011 census report, there has been an increase in internal migration from rural to urban areas. This urbanisation has put pressure on the natural resources, exacerbating the problems of waste disposal, water quality and freshwater availability (Samoa Bureau of Statistics, 2011). This is evident in the population density ratio where Apia's urban population density of 612 persons per square kilometre is ten times more than the country's overall population density of 60 persons per square kilometre (UN-Habitat & UNEP, 2014).

Samoa has a very strong culture and tradition (aganuu fa'asamoa) that embodies essential values such as family (aiga), chiefs (matai), traditional family obligations (faalavelave) and church (lotu). Many Samoans believe that Christianity and culture (aganuu fa'asamoa) are inseparably interwoven, emphasised by the motto of the country's crest "Faavae i le Atua

Samoa" meaning Samoa is founded on God. Religion plays a very important role in the lives of Samoans and its people are devoted christians. Sunday is a day of devotion and worship with no physical work done and all businesses in the city are closed. This is shown also through many traditions such as village evening curfews (Sa) around sunset for family evening prayers. There are many religions across the islands, but the major ones are the Congregational Christian Church (31.8 %), Roman Catholic (19.4 %), Methodist (13.7%), Latter Day Saints (15.1%), Assembly of God (8%) and Seventh Day Adventist (3.9%) (Samoa Bureau of Statistics, 2011).

2.2.3   National History and Political system

In 1962, Samoa was the first small island of the Pacific Region to became independent. Prior it was a country under the colonial power of Germany from 1899 to 1914 and later New Zealand under the mandate of the United Nations from 1914-1962. 1918, was a notable year in the history of the islands as it is when the ship "Talune" from New Zealand anchored in the Apia harbour and brought people infected with the deadly Spanish influenza, leading to a devastating outbreak of the disease which killed 22 per cent of the Samoan population (Tomkins, 1992). After the outbreak, Samoans and their leaders (matais) started opposing and contesting the colonial powers, resulting in the formation of the Mau crusade. The Mau[2] was viewed as a non-violent movement by Samoans as they strived for independence and sovereignty. On January 1, 1962, Western Samoa gained independence. During the colonial periods the country was known as Western Samoa, but it was not until 1997 that a constitutional amendment was made to change the country's name to Samoa. This amendment differentiates it from the neighbouring territory of American Samoa, which is still governed by the United States of America.

After independence, Samoa adopted a unique political system that combines the traditional systems of the fa'amatai (chiefs), with the European system (Westminster style). The legislative assembly (Fono Aoao Faitulafono) is the main governing body comprising 49 members; 47 members are elected to represent 41 political districts and these members must have matai titles, so only 2 of these 49 seats are set aside for non-matai members from other ethnic groups. A general election for the members of Parliament is held every five years through universal suffrage (21 years old and above). Before 1991, only those with matai (chief) titles were allowed to vote.

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[2] Meaning 'strongly held opinion' signify the strengths of Samoans

In Samoa, there are two levels of government (Commonwealth Local Government Forum, 2013). The first is central government at the national level. It is made up of the head of state (Ao o le Malo) who is elected by the Parliament for a term of five years. The Prime Minister is the head of the government who appoints a 13 member Cabinet from amongst the elected members of Parliament. These Cabinet members are Ministers for 13 government ministries. The country does not have a local district government system. This means all national matters ranging from water supply, electricity, land planning and infrastructure are managed by national level government agencies (UN-Habitat & UNEP, 2014). The second is village government. Each village has its own traditional structures which have their own governance system. The villages have 'village council' (fono a le nuu) made up of high chiefs who manage, monitor and ensure the safety of the villagers and make certain the village's rules are followed. Founded on the traditional structures, each village has its own traditional salutations (fa'alupega) based on the traditional order of title primacy in each village. The main governing legislations for village government comprise of the Village Fono Act 1990[3] and the Internal Affairs Act 1995[3].

2.2.4 Land ownership

In Samoa, 80 per cent of its land is under communal ownership while 16 per cent is government-owned. The remaining four per cent is freehold (Figure 2-2) (MNRE, 2013).
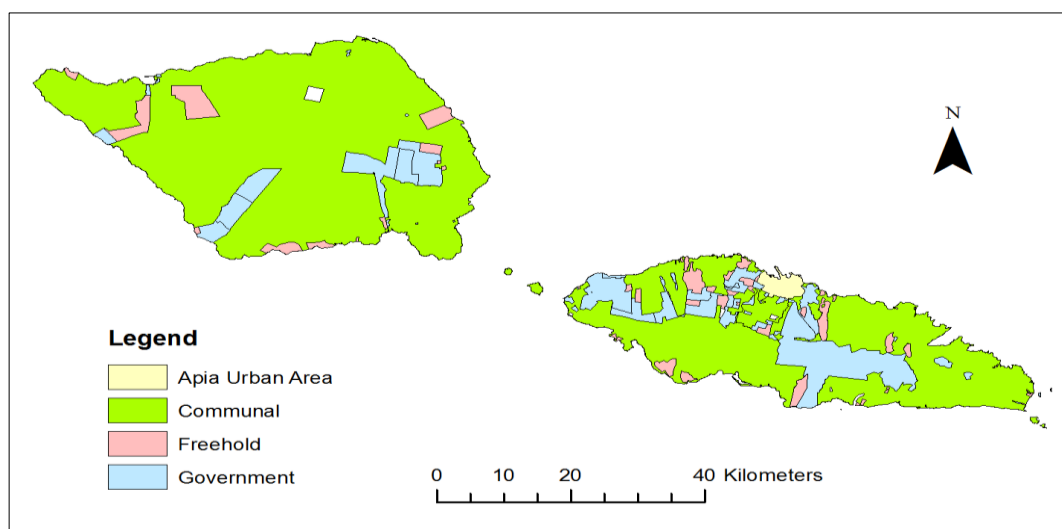
Figure 2-2 - Samoa land classification
Source - Author compilation using Land Tenure GIS layer obtained from MNRE

Therefore, the planning and management of most communal land is vested in the village chiefs and council. It is a Samoan land tradition that the de facto ownership of village communal land is acquired and claimed by whoever first clears a forest area for plantation.

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[3] These legislations are available on- http://www.paclii.org/databases.html

This traditional rule has passed down from generation to generation and has resulted in severe environmental consequences (MNRE, 2013). Most of the resources in Samoa, for instance, the water resources such as rivers, springs and streams are by law owned by the GoS. However, by virtue of this tradition, villages often disagree with this claim. As a result, when the government tries to access and conserve these resources, conflicts often arise causing delays and lengthy negotiations with regard to the management and protection of natural resources. Sometimes, these conflicts can cause disputes within and between villages, often resulting in villages backing out of environmental conservation initiatives and projects proposed by the government. In the Constitution of Samoa there are provisions on land ownership. For example in relation to customary land, article 102 states:

> 102[4]. No alienation of customary land - It shall not be lawful or competent for any person to make any alienation or disposition of customary land or of any interest in customary land, whether by way of sale, mortgage or otherwise howsoever, nor shall customary land or any interest therein be capable of being taken in execution or be assets for the payment of the debts of any person on his decease or insolvency:
>
> PROVIDED THAT an Act of Parliament may authorise:
> > (a) The granting of a lease or licence of any customary land or of any interest therein;
> > (b) The taking of any customary land or any interest therein for public purposes.

These provisions on customary land are still debateable between government and communities, because these lands cannot be sold or mortgaged but can be leased or taken for public purposes. For example, the government has conducted land surveys to identify critical land areas in the upper catchment areas to replant and rehabilitate. The issue of land ownership is very sensitive and complex in Samoa, especially when managing natural resources in the midst of traditions related to customary land. Over the past few years there has been an increasing rate in land clearance due to agriculture and settlement development. Additionally, people have started to move inland, encroaching on the upper areas of the catchment areas (MNRE, 2007b).

2.3 Overview of water resource use, challenges, changes and governance

This sub-section provides a brief overview of water resources management and governance frameworks and discusses recent changes, challenges and approaches adopted in Samoa.

2.3.1 The water resources

The major water sources for the islands of Samoa are surface and groundwater. These sources are essentially controlled by the geological formation of the islands, meaning water flows rapidly from upper catchment areas to the lowlands, outflowing from the springs and discharges to the sea (SOPAC, 2007). According to MNRE (2013, p. 98), there are more than 40 river systems in

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[4] Adapted from the Constitution of Samoa - http://www.wipo.int

Samoa: some are perennial, for instance, Fuluasou and Vaisigano rivers on Upolu island while others are mostly dry until heavy rain occurs.

More than 80 per cent of the population has access to water piping systems (MNRE,2012). Most of the water supply systems in the urban areas along with the northern, southern and the eastern parts of both large islands (Upolu and Savai'i) are supplied by surface water intakes (managed by Samoa Water Authority). While in some rural areas water systems these are managed by Water Committees of the villages in association with Independent Water Schemes Association, whereas the western sides of both islands are supplied by groundwater sources (boreholes). Despite the accessibility of water supply in most areas, the water availability is still extremely vulnerable to climatic conditions and patterns. For instance, drought events were reported in 2006 resulting from a 57 per cent drop in average rainfall associated with a moderate El Niño oscillation (MNRE, 2009) and in 2011 low river flows were recorded in the months of May to October causing rationing of the water supply in most areas of the islands (Water and Sanitation Sector, 2012).

2.3.2   The water users

The two major water users are the Electric Power Cooperation (EPC) and the Samoa Water Authority (SWA) (MNRE, 2012). EPC operates five hydro-electricity stations; three of those are located within, and are supplied by, Vaisigano sub-catchment. SWA operates surface water intakes that supply most of the eastern, southern and northern parts of Upolu and Savai'i. SWA also has a number of boreholes that supply water to most of the western areas of both islands.

Agriculture is carried out on the islands but on a small scale and irrigation is not practiced. Most farms and farmers used rain-fed systems and water supply from the SWA reticulated supply systems to water their crops and animals. There are private water bottling companies who have boreholes that are operated privately. Samoa's industrial use of water is quite low and such uses are supplied by the SWA water supply line.

2.3.3   The water service providers

The SWA is the major water service provider in the country. SWA provides water services for about 80 per cent of the whole population. The services they provide include reticulated water supply systems which are metered for treated water but non-metered for untreated water. SWA also manages the only wastewater treatment plant on Upolu Island that is located at Sogi (within Apia Catchment) which serves most commercial businesses in the central business district (CDB).

The second water service provider is Independent Water Schemes Association (IWSA). This is a non-government service provider established in 2007, house within the Ministry of Women, Community and Social Development (MWCSD). Currently, there are 32 village schemes under the IWSA providing water for some areas in the rural villages (Water and Sanitation Sector, 2012). These schemes have their own Water Committees which run the day to day monitoring and maintenance of their own piping system. The IWSA receives assistance from the government and overseas aid and funding for system rehabilitation and maintenance.

2.3.4 The challenges and changes in water resources management

According to the State of the Environment Report (MNRE, 2013), Samoa has abundant water resources compared to many other Pacific islands. However, the nation faces several challenges in the management and governance of its water resources. These challenges include but are not limited to: inadequate capacity in terms of finances, human and capital resources of government ministries to carry out enforcement and mandated duties related to water resources management and governance; and limited historical data on quality and quantity of surface and ground water, preventing accurate assessment of the resource. Moreover, the communities have limited understanding of the impacts of human activities, thus lesser appreciation of the costs involved in managing water resources on the customary ownership land. These lead to the common perception by local communities that water is free, a gift given from God. This perception increases unsustainable use of water leading to high water consumption levels per capita especially in the urban areas (MNRE, 2010,2013). Moreover, these local perceptions often result in lengthy negotiations and conflicts between government and villages with regard to access, protection and conservation of water resources, especially in critical catchment areas. Exacerbating the issues are the land use impacts, such as the continuous clearing of the upper catchment areas for agriculture and housing developments that lead to increased erosion, sedimentation and poor water quality of downstream during and after heavy rain.

These pressures arise from urbanisation, expansion of domestic water uses due to increased demand from the growing population and higher standards of living (MNRE, 2013), the frequent occurrence of cyclones, lowland flooding and drought events. Furthermore, climate change is seen to be causing high fluctuations of evaporation and precipitation affecting surface water flows and aquifer recharge levels. Also, sea level rise is causing sea water intrusion to groundwater aquifers (MNRE, 2013). These challenges and pressures continuously hinder the sustainable management and governance of water resources. While, Samoa faces tremendous challenges and problems in managing its water resources, far-reaching changes have occurred in its water institutions, management and governance.

A decade ago the Government of Samoa (GoS) undertook major reforms across the Water and Sanitation Sector; this was funded by the European Union (EU) (MNRE, 2012). A Sector Wide Approach (SWAp) framework was adopted in the Water for Life Action Plan for Samoa (2008-2011). Its aim was to overcome the challenges of poor coordination and lack of resources and to increase information-sharing within the Sector agencies. According to Water and Sanitation (2008) this was a necessary shift away from a business-as- usual approach to a sector–wide approach reinforcing the message that "water is everybody's responsibility" (p. 1). The IWRM framework was adopted by the Sector under this national plan (2008-2011) to ensure sustainable water resource management. At the end of 2011, the Sector reviewed its national action plan and later launched the 'Water for Life Action Plan 2012-2016'. This national plan for Samoa's Water and Sanitation Sector is also IWRM focused (Semisi, 2012). Its implementation is overseen by the Water and Sanitation Sector Coordination Unit (WSCU) and put into practice by the sector agencies. According to MNRE (2012), the success of the SWAp framework since its implementation in 2005 in mobilising resources and effective management of water resources, developments and supply, has meant that the EU has agreed to provide more funding. Consequently, the GoS has embraced SWAp as the appropriate mechanism for the implementation and management of water resources (MNRE, 2012). The outcome of the approach has been used by the GoS and donors to syndicate funding (overseas and local budgets) for the Sector to support a single sector policy, strategy and goal (MNRE, 2012). That goal is to provide "reliable, clean, affordable water and basic sanitation within the framework of IWRM, for all people in Samoa to sustain health improvements and alleviate poverty" (MNRE, 2012, p. 9). In pursuit of this goal the Sector uses the IWRM framework with its four key principles to guide its work to ensure the sustainable management of water resources (MNRE, 2012). These principles are i) freshwater is a finite and vulnerable resource ii) water development and management should be based on a participatory approach, involving users at all levels, iii) women play a central part in the provision and management of water and iv) water has an economic value in all its competing uses and should be recognised as an economic good (MNRE, 2012, p.44; MNRE, 2007a, p. 6).

The institutional reform allowed the Sector to transform and separate duties and responsibilities between regulators (government ministries) and water service providers (MNRE, 2012). Figure 2-3 illustrates the structure of the Sector and provides an overview of the government ministries, state-owned enterprises and non-government organisations (e.g. The Plumber Association, Red Cross and IWSA) involved in water governance and management. The expectation is that both water resources and service providers are managed effectively and cost efficiently in response to the increasing problems and challenges in water resources. For

instance, the management and governance of water resources is essentially the role of the Water Resources Division (WRD) located in the Ministry of Natural Resources and Environment (MNRE), whereas Samoa Water Authority (SWA) is responsible for the provision of water supply services i.e. infrastructure and piping systems.

Prior to the institutional reform in 2005, the management of water resources in Samoa was fragmented. It was controlled and managed by different government departments (Water and Sanitation Sector, 2008). So, in 2006 the WRD was established under the MNRE, as the head agency to manage, protect and control the allocation and usage of water resources in Samoa (Water and Sanitation Sector, 2008). The WRD consists of three sections namely, Hydrology, Watershed Management and Policy and Regulatory. Prior to the establishment of the Water Resources Division (WRD), the Hydrology Section was housed within the Meteorology Division, while the Watershed Management Section was under the Forestry Division of MNRE. The Policy and Regulatory Section was the only newly established section created to facilitate the establishment and implementation of policy and legal frameworks (MNRE, 2008).
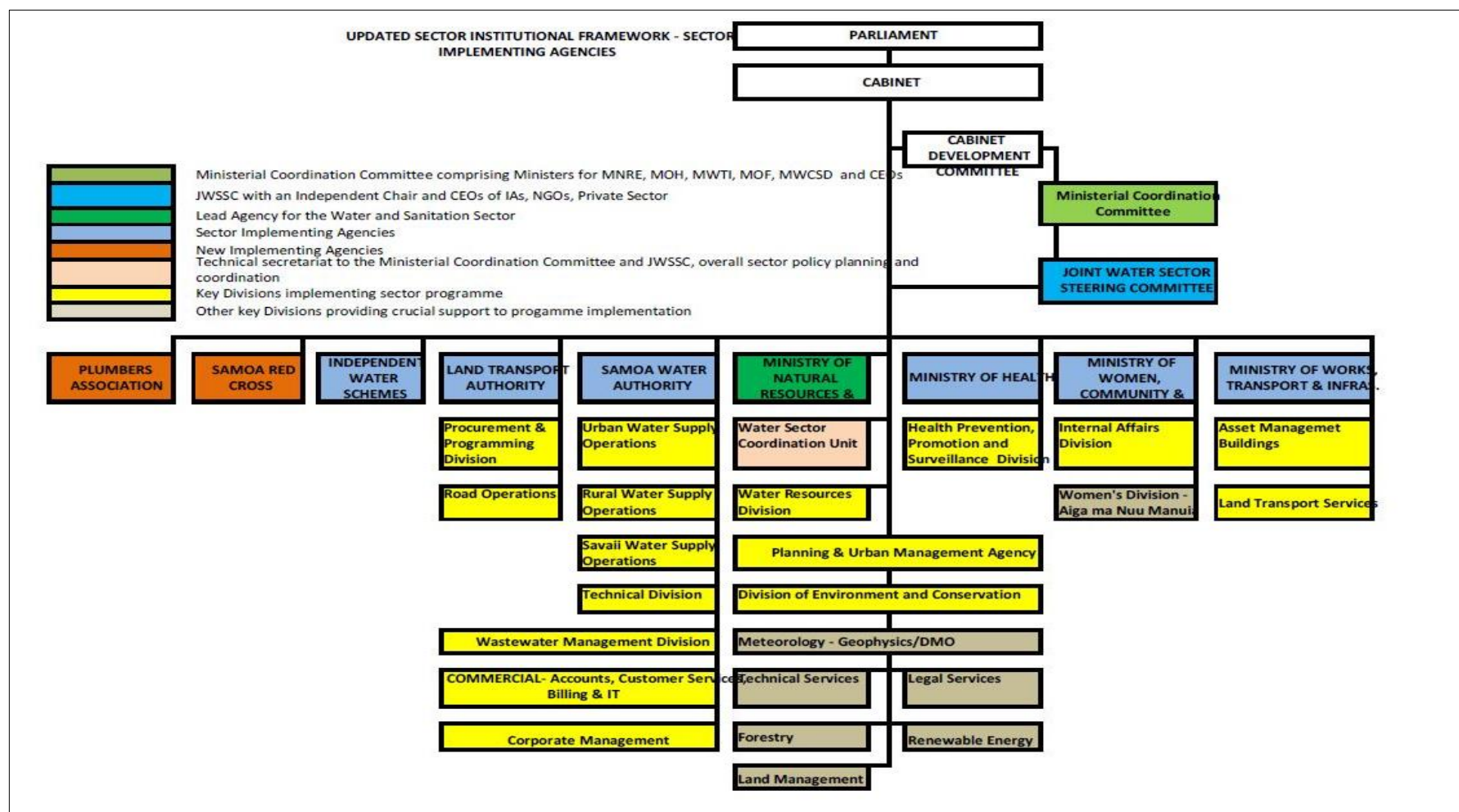
Figure 2-3 - Water and Sanitation Sector organisational structure at the national level
Source: (Ministry of Natural Resources and Environment, 2012, p. 52)

2.3.5 Water resource governance and regulatory frameworks

The problems and challenges we face with the available water resources are not just due to the physical nature of water, for example, its poor quality and limited quantity, but also water governance. This section discusses water governance frameworks in Samoa.

Water governance is defined as "the political, social, economic and administrative systems that are in place, and which directly or indirectly affect the use, development and management of water resources and the delivery of water service at different levels of society" (UNDP-Water Governance Facility, 2015). Rogers and Hall (2003) state that, the key role of governance is to create an institutional and administrative framework where water users or stakeholders with different interests can cooperate and coordinate their activities. In the case of Samoa, most of the water governance and management framework transition occurred after the establishment of WRD. This included the review of National Water Resources Management Policy 2001 to the current National Water Resources Policy (NWRP) 2010, followed by the development and formulation of the several other core pieces of legislation and policies discussed below. Table 2-1 summarizes some key reforms in water resources management since 1992.

The Water Resources Management Act 2008[5] (hereinafter referred to as the WRM Act) provides the national legislative framework for the management, protection and conservation of the water resources in Samoa. The interpretation and definition of water resources in the WRM Act includes surface and groundwater aquifers, lakes, waterfalls, rivers, streams, springs and watershed or catchment areas. As stated before, water resource management was fragmented in the past. The government has tried to address these issues through institutional reforms and adoption of legal frameworks. The WRM Act 2008 replaced the Water Resources Management Act 1965 and the Watershed Management Regulation 1991. The WRM Act brought a major a shift in water resources management and governance by recognising the need to manage water resources in a manner that recognises the involvement of local communities in water management through the development of village and community by-laws and Watershed Management Plans (WMPs).

While the WRM Act was under review by Parliament, the first National Water Resources Strategy (NWRS) 2007-2017 was published in 2007. This was developed to support the putting into practice of the WRM Act. The NWRS was developed through a combined effort of all government ministries, state-owned enterprises (SOE) and NGOs. Furthermore, NWRS presents the tools by which to plan, conserve, develop and manage water resources as well as ensuring collaboration between different stakeholders so as to achieve the national goal and objectives of the government (MNRE, 2007).

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[5] Source - http://www.paclii.org/ws/legis/consol_act_2013/

In 2010, National Water Resources Management (NWRM) Policy was introduced. The policy promotes a ridge–to–reef approach in water resources management i.e. an IWRM based framework in recognition of the impacts on coastal marine waters due to the unsustainable developments in upstream areas of catchments. The endorsement of this policy illustrated the commitment of the government to 'develop and implement practical strategies' to cater for the conditions of these critical catchments. Such 'practical strategies' include increase community awareness, strengthening watershed conservation and improving water uses efficiency, as well as, ensuring people living in these critical areas have access to secure, reliable and sufficient water (MNRE, 2010).

Subsequent to the NWRM Policy, the Water Licensing Regulation and Scheme was formulated in 2011, to regulate water uses and understand its impacts. This legal tool was initiated by the government to try and control the use of available water for different purposes and between water users such as energy, agriculture and water supply agencies. It is compulsory for all new and existing water users to register and apply for water abstraction licensing and permits as required by the WRM Act. Licences are valid for a period of five years and under the law the Minister of MNRE has the power (subject to advice from the National Water Resources Management Board [WRMB]) to vary, suspend or revoke licences for any purpose that is consistent with the protection, conservation and sustainable management of water resources. Even so, the scheme is still in its early stages and is not yet fully running; nevertheless, government's, priority is given to the highly utilized catchments such as Apia Catchment.

In addition, the WRM Act also recognises the involvement of local communities in water management through the development of village and community by-laws and watershed management plans (WMPs). Watershed Management Plans are more catchment specific. These are structured technical guides for the sustainable development, use and management of each catchment area. They are developed by MNRE in pursuant to Part VIII of the WRM Act, by order of the Minister of MNRE and will enter into force when approved by the Head of State in accordance with section 26 of the WRM Act. The purpose of WMPs is to provide an overview of the current characteristics of a catchment and thus identify implementation actions required to protect and conserve its water resources. Most importantly, these plans serve to "safeguard the designated uses of the catchments and to promote sustainable land use activities with community involvement" (MNRE, 2012, p. 6).

The formulation of village and community by-laws is under Part IX of the WRM Act, and is develop to support the implementation of WMPs. Some examples of the by-laws include no dumping of garbage or discharge of pollutants of any kind nearby or in the water resource, no cutting of trees within 20 metres from rivers or any water sources and no plantation developments near water sources. These by-laws are also meant to encourage community engagement and participation, so assisting MNRE in the enforcement of the WRM Act. Although, it is called village and community by-laws in the WRM Act, how these by-laws are currently named and set up is different on the ground. For example, there are many individual villages, but a collective village by-law document (hereinafter referred to as the catchment by-laws) is developed to govern the whole sub-catchment area. These catchment by-laws are intended for each individual village to monitor and enforce through which decision-making is then made at the catchment level.

Table 2-1[6] – Summary of key changes in water management and governance frameworks

Year	Changes and reforms
1992	The Watershed Protection and Management Regulation was established and enacted under the direction of the Water Resources Management Act 1965.
1993	The first National Environment Management Strategy (NEMS) for Samoa was developed following the 1992 UN Conference on Environment and Development Rio Declaration.
1994	SWA was established to oversee water supply development and infrastructure
1996	National Water Resources Master Plan was developed by SWA
2001	National Water Resources policy (NWRP) was developed and approved by Cabinet with reference to National Environment Management Strategy (NEMS) 1993
2005	EU-funded Water Sector Support Project (2005-2010) was launched and Water Sector Coordination Unit (WSCU) was established under Ministry of Finance (MoF) to manage the EU funds and budget for WaSSP programmes and the Sector was established.
2006	WRD was established under MNRE (transfer of Watershed Section from Forestry Division to WRD/MNRE and Hydrology Section from Meteorology Division of MNRE to WRD/MNRE)
2007	SOPAC in collaboration with the GoS developed a National Integrated Water Resources Management Diagnostic Report for Samoa in preparation for the IWRM GEF-funded demonstration project proposal. Apia Catchment was chosen as the project site.
	National Water Resources Management Strategy (NWRMS) 2007-2017 endorsed by Cabinet
	Hydrology Section set up the first National River Monitoring System
2008	Water Resources Management Act 2008 (WRM Act) endorsed by Parliament
	Water for Life Sector Plan (2008-2012) launched

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[6] The key dates and achievements listed were adapted from these reports (Rofe & GM Meredith & Associates, 1996; Taule'alo & Wulf, 2000; Water and Sanitation Sector, 2008, 2009, 2010, 2011, 2012)

Year	Changes and reforms
2009	Transfer Water Sector Coordination Unit (WSCU) from MoF to MNRE
	Inception of IWRM GEF funded project for Apia Catchment. The IWRM project management unit was housed in MNRE within the Watershed Section of the WRD.
	Water Abstraction Licensing Scheme up and running
2010	NWRM Policy 2001 amended and endorsed by Cabinet
	National Water Service Policy endorsed by Cabinet
	National Water Allocation Policy (Drafted)
2011	First catchment by-laws for Aufaga and Tafitoala catchment were approved by Cabinet
	Water Licensing Regulation developed
2012	Water for Life Framework for Action Plan 2012-2016 launched and implemented
	Fuluasou and Vaisigano catchment by-laws in draft waiting approval from Cabinet
	National Water Resources Management Board (NWRMB) was established
2013	Watershed Management Plans for catchments of Aufaga, Tafitoala, LOA and Fuluasou, Vaisigano, Togitogiga, Faleaseela, Gasegase in place waiting for endorsement by Cabinet
2014	Draft National Upland Watershed Conservation Policy (on hold)

2.4 Summary

This chapter has presented the overall context and background of Samoa, the early water resources planning, management and governance frameworks that have been utilized and the current situation. It has also traced significant reforms with a shift in management focus to issues of water governance, highlighting factors of land issues, climate change, natural disasters and implementation of governance framework. Institutional reforms were undertaken by the GoS to overcome the fragmented control and management of water resources with a lot of changes having occurred in the Sector over the years. There have been achievements but still more and more challenges keep raising and some still persist and haunt the country.

Chapter 3 – Conceptual Framework

3.1   Introduction

This chapter presents the conceptual framework. As such, it sets out a literature review of recent debates and ideas in the arena of catchment scale water governance and management with a focus on the concept of scale. Foundational to the IWRM framework, water resources are managed along catchment boundaries. The concept of scale has always been important in natural resources management, and it underlies the way in which I engage in exploring and analysing the data gathered for this research and drawing findings.

3.2   Scale as a concept

3.2.1   Definition

The term 'scale' has range of meanings and is used differently across disciplines. For example, in ecology it usually refers to the spatial and temporal dimensions of a pattern or process. In sociology it defines social structures from individuals to organizations, as well as social institutions i.e. rules, laws, formal and informal cultural norms that govern the spatial bounds of resource access rights and management responsibilities (Cumming et al., 2006).

Johnston, Gregory, Pratt, Watts, and Whatmore (2009) highlight three distinct meanings of scale. First is cartographic scale which "refers to the level of abstraction at which a map is constructed". Second is methodological scale which "refers to the choice of scale made by the researcher in the attempt to gather information aimed at answering a research problem". These first two meanings are closely related but have distinct uses in different terms. The third meaning of scale is geographical scale and refers to "dimensions of specific landscapes" for example cities, countries or the global scale (pp.724-725). In the same sense Gibson, Ostrom, and Ahn (2000) refer to scale "as the spatial, temporal, quantitative or analytical dimensions used to measure and study any phenomena" (p. 218). Levels are positions along a scale. Daniell and Barreteau (2014) expanding on Cash et al. (2006) representation of scale by showing the different scales schematically (Figure 3-1[A- H]) with examples of levels along each scale. They emphasise that although almost all attention is given to spatial, temporal, jurisdictional and institutional scales, it is also important to consider other scales such as management, networks, knowledge and issue scales (Figure 3-1 [E- H]). This research makes use of the spatial and administrative scale to conceptualise and analyse data in this study.
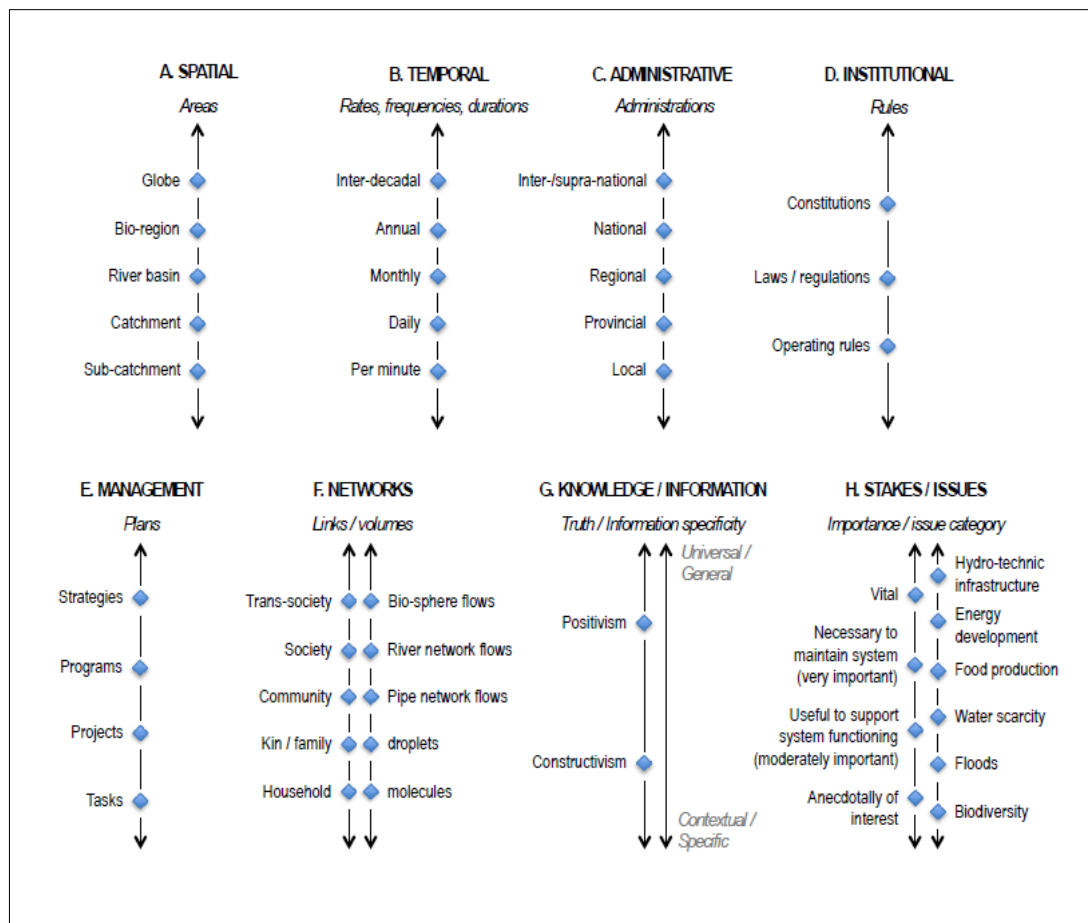
Figure 3-1- Representation of the different scales (A-H) and levels along each scale
Source: (Daniell & Barreteau, 2014, p. 5)

Many scholars have discussed the meaning and aspects of the concept of scale. Jonas (2006) and Marston (2000) discuss the ontological and epistemological underpinnings of the concept of scale. Sayre (2005) describes scales and levels as being either produced or pre-given; Neumann (2009) discuss the perspective that scales and levels are produced and are socially constructed i.e. "changeable by humans and not connected to territorial conditions" (Grund, Huesker, Jager, Moss, & Newig, 2011, p. 5). Herod (2011) identifies scale as a "complex concept" given its contested "ontological status" i.e. whether scale "actually exists as a 'real thing' materially manifested in landscapes or whether this is simply mental devices by which we make sense of the world" (pp. xii-xiii). Brenner (as cited in Warner, Wester, & Hoogesteger, 2014) deliberates on the 'politics of scale' through which "spatial scalar hierarchies are oriented toward the reorganization, reconfiguration and even transcendence of existing scales" (p. 469). In governance systems, scale can be used to explain how different groups seek to influence and control levels of organisation and the relationships between them. While many have described scale as socially constructed and historically changeable through social and political contestation, others, particularly Marston, Jones III, and Woodward (2005) have critiqued the

concept of scale stating that it reinforces hierarchal models and thus, should be disregarded and substituted with flat alternative or "flat ontologies" that are reflective of emergent spatial relations (p. 422). In such an approach scale may ultimately be part of a realistic expression that does not exist in any material sense (Herod, 2011, p. 33).

While, recognizing the critiques of the ontological status and debates on conceptualizing, this study took a realist approach and draws on the work of Moore (2008) and Kaiser and Nikiforova (2008). These authors argue that scales should be investigated through a performativity approach, shifting the focus away from an investigation of what scale is and onto how scale is performed and materialized. In this way, we act as though scales do exist in a material sense.

3.2.2   The problems of scale

According to Gibson, Ostrom, and Ahn (2000) all scales have *extent* and *resolution* properties (p. 219). Extent refers to "the magnitude of a dimension used in measuring a phenomenon". For example in a scale of time, the extent may involve increasing from a day, a week, a month, a year, a decade, a century and a millennium or in a geographical scale extent can describe area. Resolution, often used interchangeably with grain, refers to the "precision or unit used in measurement". For example, in the scale of time, the level is a week and the grain could be days or hours. Increasing extent and grain reiterates the idea of multiple levels. Figure 3-2 illustrates an example of increasing extent, from individuals, to households, to country, to regional to national. Individuals (persons) or households can be the measuring unit depending on the issue examined.
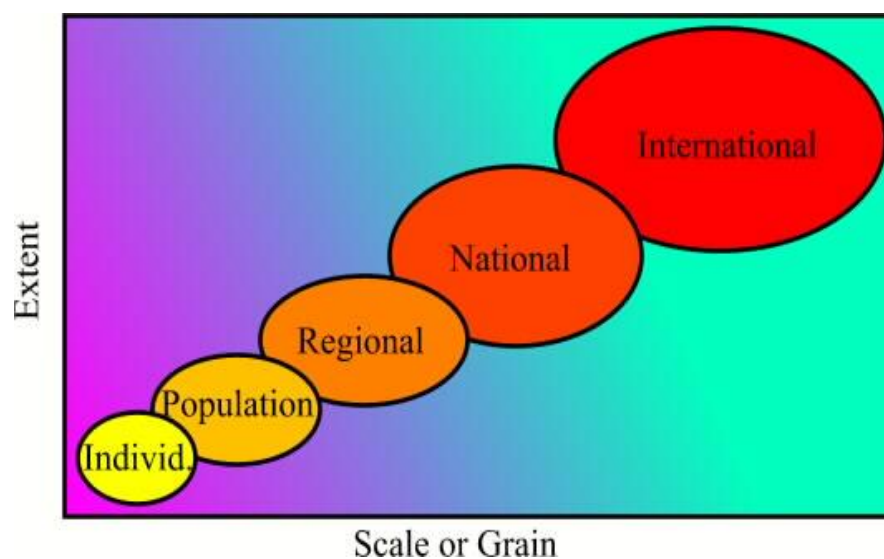
Figure 3-2 - Visualisation of increasing extent and grain
Source: www.feralindia.org/moodle

The importance of discussing extent and resolution underlines how situations are observed. According to Gibson et al. (2000) the problems related to scale are fundamental because the processes and parameters important at one scale or level may not be significant or predictive at another scale or level. That is, the scale, extent, resolution and the diversity of levels on a scale can affect the explanation of a phenomenon and vice versa. For example, if a study is conducted to investigate the changes in water quality of a river at a catchment scale using aerial photographs and monitoring data, we would most likely come out with a different conclusion if we then examined water quality onsite at the local scale. Therefore, an understanding of different scales and levels is vital because levels and scales have complex systems interconnected within them.

Cash et al. (2006) further discuss the importance of understanding the problems of scale by highlighting diagrammatically the interactions amongst the different scales and levels and between levels of the same scale (Figure 3-3). The arrows in Figure 3-3 show interactions across levels and scales or between the levels of the same scale. An example of these interactions can be between high levels of management and local level authorities or the outcomes of activities along each level or scale. According to Cash et al. (2006) these interactions are complex with possible changes in strength and direction over time. Figure 3-3 shows the increasing complexity of these interactions between levels and scales. The top of Figure 3-3 represents the simplicity of a single scale with multiple levels with no interactions (no arrows) to a more complex situation of scales and level systems (Figure 3-3 bottom) with lots of interactions. These cross levels and scales interactions focus on the extent and resolution properties of scales and levels i.e. multiple levels and scales.
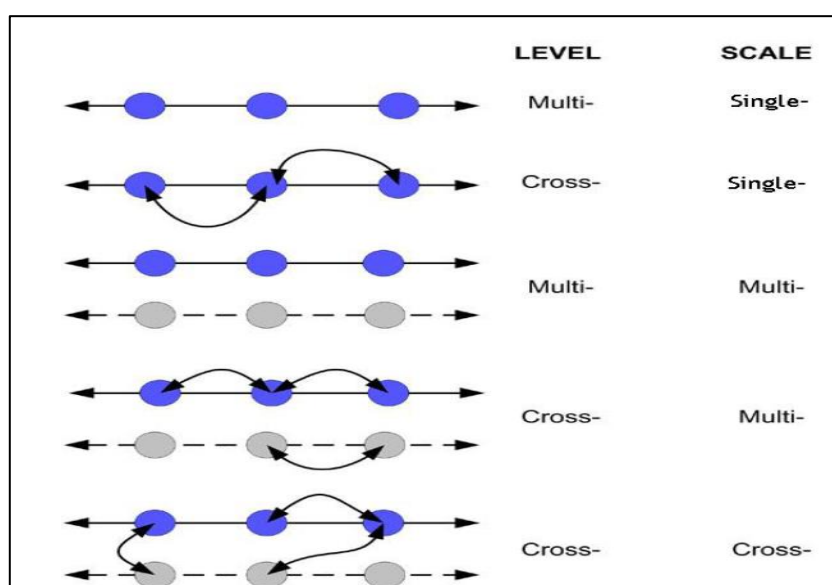
Figure 3-3-Illustration of cross-level, cross-scale, multi-level and multi-scale interactions
Source- (Cash et al., 2006, p. 5)

Scholars such as Lovell, Mandondo, and Moriarty (2003) refer to these interactions between levels of the same scale as scaling up or down. The challenges involved in this interaction; for example, between levels of administrative scale, is the lack of coordination and collaboration i.e. when the local level communities are inaccessible and unaware of the decisions in the top level management and the top level management does not encourage local community participation or is out of touch with communities. These challenges increase our understanding of the problems of scale and are explored by examining interactions between levels and scales as highlighted in Figure 3-3. Cumming et al. (2006) refer to the problems encountered in these types of interactions as 'scale mismatch'.

3.2.3   Scale mismatches

Given that humans can never be isolated from the natural world and that over time changes have occurred in natural systems, perspectives that integrate humans into natural systems are now seen as essential. According to Buizer, Arts, and Kok (2011) over the past decade, social–ecological systems have become the leading paradigm in linking complex systems to the scale issue. Several frameworks have been put forward by scholars, for example, the "panarchy framework" by Gunderson and Holling (2002). Panarchy is drawn from the combination of 'Pan' after a Greek god which denotes unpredictable change and 'archy' from hierarchy, representing multi levels and scales of the interconnected nature of systems (Gunderson & Holling, 2002, p. 5). The panarchy framework is a nested set of adaptive cycles operating at a discrete range of scales. The adaptive cycle describes the process of development and captures complex systems that reflect the dynamic nature of human and natural structures over time and space (Gunderson & Holling, 2002). This framework explains social-ecological systems and the complexity in resource management issues, for instance, the mismatch between the scales or levels of management and biophysical resources being managed.

Cumming et al. (2006) describe scale mismatch when "the scale of the environmental variation and the scale of the social organisation responsible for management are aligned in such a way that one or more functions of the social-ecological system are disrupted, and/or important components of the system are lost" (p. 3). According to a number of authors, humans and environmental systems are facing a range of problems due to the issue of scale mismatch. Sayre (2005) explains that "when human responsibility does not match the spatial, temporal or functional scale of natural phenomena, unsustainable use of resources is likely and it will persist until this mismatch of scales is cured" (p. 277). Cumming et al. (2006) citing Lee's (1993) suggestion of scale mismatch between social and ecological systems and categorized these mismatches diagrammatically into spatial, temporal and functional (Figure 3-4 illustrates spatial mismatch). Folke, Pritchard, Berkes, Colding, and Svedin (2007) describe spatial mismatch

occurring when the boundaries of management do not coincide with the boundaries of an ecological entity. Figure 3-4 shows the emerging consequences of spatial scales mismatched (indicated in red). For example, many global environmental problems such as climate change are too big for small social system organisations (e.g. local authorities) to control. This environmental problem also needs to be studied at the global level of the spatial scale while dealing with it requires the local level authorities to act at an administrative scale. As a result, the local level has no control over these global problems and the local conditions are likely to be different. In contrast, national policies that seem right for a specific area at the broader scale can have unsuccessful outcomes at a finer scale. For example, the introduction of standard guidelines to govern the use of natural resources that is common in some places and rare in other areas. As such, regulations typically need to be determined at somewhat fine-scale (Cumming et al.,2006).
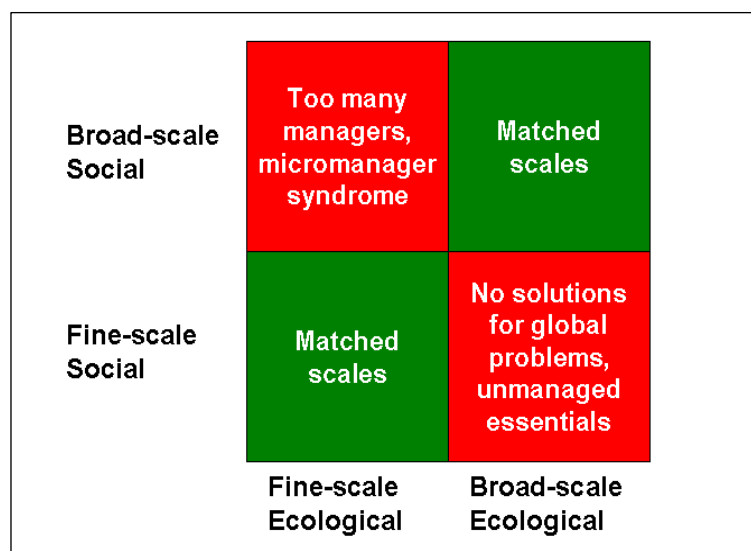
Figure 3-4- Mismatch in spatial scales
Source: (Cumming, et al., 2006, p.4)

Cumming et al. (2006) discuss this further in describing four situations of mismatches or misalignments (Figure 3-5 [a-d]) in natural resource management between ecological processes and the people managing these ecosystems. In Figure 3-5 [a-d] the green boxes represent ecological processes and the blue boxes represent resources mangers or people managing these ecosystems. There are three levels A, B, C. The overlapping boxes represent the interactions between these levels.
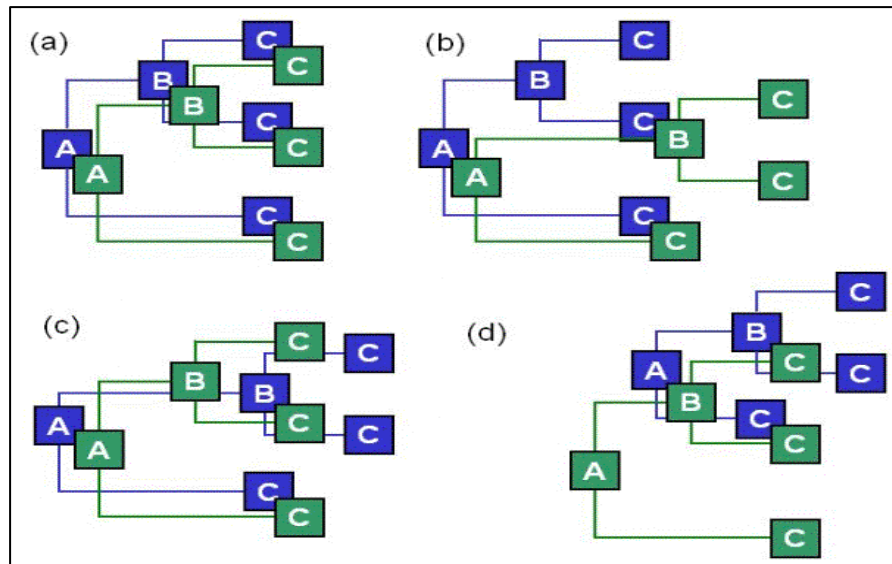
Figure 3-5- Situations of misalliances or mismatches in natural resources management
Source: (Cumming et al., 2006, p.7)

Figure 3-5[a] represents an ideal situation where the ecological processes will be managed by people who have the mandate and the power to act at the same level as the ecological process. Figure 3-5 [b] represents scale mismatches may result when the upper-level managers have nothing to do with or do not relate to the lower level manager or the same ecological process level, while the lower-level managers are confronted with ecological problems that they lack the resources to deal with (C-B mismatch). Figure 3-5 [c] - another kind of mismatch results in a lack of management at some key scales (unmanaged B) and the involvement of higher-level managers in lower-level resource management (B-C mismatch), leaving junior managers with little power to effect change (hanging C). Figure 3-5 [d] - in a global or international context, a common scale mismatch occurs when no institution exists to deal with the broad scale environmental problems (unmanaged A). Note that in many scale mismatch examples these are not necessarily system-wide (Cumming et al., 2006). This means there may be some misalignment or mismatch between and within levels of one scale or between different scales and levels but not all the time or all at the same time.

In addition, Redman, Grove, and Kuby (2004) emphasise that it is possible that these types of cross-scale and level mismatches are responsible for many social and ecological system vulnerabilities that could lead to system(s) breakdown(s). Pelosi, Goulard, and Balent (2010), also maintain that scale mismatches are at the centre of non-sustainable management of resources. Therefore, it is very important to identify these mismatches and misalignments in levels and scales. Understanding scales and associated levels is critical to understanding the whole system and can reduce possible consequences of mismatches as highlighted in Figure 3-4 and 3-5 due to lack of interactions and collaboration between levels and scales.

These insights raise the question: in order to achieve resource sustainability what is the right scale or level for management? Important for this research is the emphasis that the IWRM framework has placed on the catchment as the appropriate level and scale for water management and governance (GWP, 2000; UNEP, 2012).This has resulted in institutional reforms such as setting-up of River Basin Organisations (RBO) and administration frameworks at the catchment level of the spatial scale, operating within geographical boundaries in alignment with what is deemed to be the natural ecosystem flow of water. For example, the European Union Water Framework Directive (WFD), the centrepiece legislation of European water resources, states its overall aim is to reach 'good water status' by 2015 (Article 4) for all European, the achievement of this goal is to be conducted through an integrated river basin approach (Article 3). This policy establishes the river basin as the 'natural entity' for management and the overarching spatial governance unit (Grund et al., 2011; Moss, 2012; Smedley & Rowntree, 2012).

However, several scholars have identified limitations and challenges in adopting catchment scale governance and the implementation of the IWRM approach. Warner, Wester, and Bolding (2008) believe that catchment management does not need a strong centralized organisation. In the same way Horlemann and Dombrowsky (2011) discuss IWRM as boosting the challenges which have resulted in the "problems of fit and interplay" across scales and levels (p.1548). Moss (2012) claims that ''institutions oriented around biophysical boundaries will inevitably create new boundary problems and fresh mismatches" (p. 4). He investigated the spatial organisation of water management in the European Union and found the spatial 'fit' of river basin units along the political administrative territories exacerbate the problems of 'interplay' between water sector stakeholders, thereby creating different territorial units for water management. Correspondingly, Sneddon (2002) states that "the mosaic of ecological systems constituting river basins, which act according to their own logics, pays little attention to how resources are construed and categorized by human environmental managers" (p. 727).

IWRM promotes the principle of subsidiarity i.e. decentralizing decision making to the lowest appropriate level (GWP, 2000, pp. 13-14). Advocates of IWRM and other scholars believe local level management can improve integration of water resource management (Manyanhaire & Nyaruwata, 2014). An example from the Philippines illustrates that the presence of committed, supportive stakeholder groups at the local level can foster sustainability of IWRM initiatives, even in the face of competing political issues (UNEP, 2010, p. 9). However, Brown and Purcell (2005) noted the need to be aware of the 'local trap' in which organisation, policies, and action at the local scale are thought to be inherently more likely to have desired social and ecological effects than activities organised at other scales and levels.

This may also be applied to all other levels and scales i.e. no specific level or scale can essentially be more appropriate and desirable than others in order to achieve sustainability in resources and accomplishing policy and strategic outcomes. Therefore, scales and levels existence involves complex social, ecological and political interactions that continuously construct the dynamics of scales and levels as they constantly evolve.

3.3   The challenges of managing at the catchment scale

The emergence of IWRM has resulted in greater social acceptance and importance being given to catchment management. It was in fact after the International Conference on Water and the Environment Conference (ICWEC) in Dublin 1992 and the 2002 World Summit on Sustainable Development that many countries, including developing countries, signed the declaration and support the call for the application of integrated approaches to the development, management and use of water resources; which also emphasised integrated water resource management (IWRM) should be carried out at the level of the basin or catchment (Giordano & Shah, 2014; Hering & Ingold, 2012; Perry & Easter, 2004; UNEP, 2012, p. 76).

Managing and governing at a hydrologically defined scale holds a certain appeal because of the apparent naturalness of its morphological boundaries (Warner et al., 2008) which removes them from the arbitrariness and mutability of other human - created borders (Schlager & Blomquist, 2000, p. 12). It offers the semblance of a physical 'natural' management unit (Pereira, 1989, p. 9) which can confine the interrelations between water sources, uses and users in a certain area (Blomquist & Schlager, 2005). It can also assist in demarcating management areas for legislation purposes and institutional settings for governance arrangements (Davidson & de Loë, 2014; Lovell et al., 2003). Managing at the catchment scale is seen to be especially ideal in addressing cases where natural resources problems are hydrologically defined such as flood plains, water quality and quantity or wildlife habitat and places where strong governance systems already exist (Davidson & de Loë, 2014; Gelt, 2000; Molle, 2009;). Similarly, Jaspers (2003) argues that "water resource management along hydrologic boundaries is not a new phenomenon" (p. 80). He points out that water necessarily has to be managed on hydrologic boundaries, because water simply tends to flow down and it does not stop at the boundary of the district or region. With these logical reasons and views, managing and governing along catchment boundaries has become an almost unquestionable water management and governance ideal. The uptake of catchment scale management embedded within the IWRM framework typically includes the setup of new institutions or specific River Basin Organisations (Horlemann & Dombrowsky, 2011) that operate at the catchment level.

The first institutional role model of river basin or catchment level organisation was the establishment of the Tennessee Valley Authority (TVA). The TVA claims that essentially catchments and river basins should be managed as units integrating the managing of land and water (Gelt, 2000; Molle, 2009). The success of the TVA model in the 1930s led to the spread of cloned TVA prototypes around the world (Gain et al., 2013). For example, in the Pungwe River basin that spans Zimbabwe and Mozambique, in southern Africa, both countries agreed to jointly establish a catchment-scale River Basin Organisation (RBO) to give effect to policies and legislation to manage the Pungwe River basin. Since this RBO came into existence, action has been taken on several environmental issues such as the development of databases and reporting mechanisms on water quality and sediment transport, conservation areas and environmental flow requirements for the Pungwe River (Leendertse, Mitchell, & Harlin, 2008).

However, Warner et al. (2008) argue that moving towards sustainable catchments requires much more emphasis on developing collaborative relationships for water governance and management that are built on existing organisations, customary practices and administrative structures rather than the current focus on the establishment of these unitary RBOs. The concern of Warner et al. (2008) is that the focus on the establishment of RBOs can compromise current policies or involve new institutions, policies and responsibilities that can cut across existing customary practices and institutional arrangements to the detriment of water governance and management. Along similar lines, Davidson and de Loë (2014) claim that watersheds are not essential components for the implementation of IWRM and nor should they necessarily be its foundation. Molle (2008) refers to the IWRM as a "nirvana concept" i.e. a concept that embodies ideal images of what the world should be or a vision of a prospect for individuals and societies to strive for but not attain (p. 132). Obviously, there is debate on the exact meaning of IWRM in terms of its implementation and promoting catchment as the unit for water governance and management (Biswas, 2004, 2008; Mollinga, 2008; Saravanan, McDonald, & Mollinga, 2009). These views emphasise that mapped hydrologic boundaries are constantly changing and so is our understanding of surface and groundwater resources though it may still be difficult to define the boundaries. As a result, choosing which watershed boundary to use is often as much a political act and choice as it is a scientific or natural one (Blomquist & Schlager, 2005). Furthermore, Warner et al. (2008) argue that "river basin boundaries and institutional arrangements are not natural but matters of choice and contestation" (p.133). Schlager and Blomquist (2000) added, drawing boundaries are the first steps in defining decision makers i.e. who controls what, who gets what, and how will water be affected, all these types of questions and decisions will arise. This indicates that different boundaries imply different decision makers and different effects upon resources and people. Therefore, the notion that catchment area can inevitably incorporate

all water resource governance and management issues and communities' concerns is in question (Blomquist & Schlager, 2005; O'Neill, 2005).The concerns of these authors is that this new scale for planning, managing and decision-making embedded within IWRM can present several challenges if it is imposed over pre-existing scales of decision making such as the nation, districts and communities and consequently wear down or invalidate existing cohesive social and cultural practices.

In concern with the use of catchment boundaries for water governance purposes Cohen and Davidson (2011) talk about five key challenges that may occur. These are boundary choice, accountability, public participation and asymmetries with problem-shed and policy-shed.

- **Boundary choice**

An example of the issue of boundary choice relates to the complex nature of watershed boundary description and definition. According to Cohen and Davidson (2011) the common definition of a watershed is an "area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course" (USEPA, 2012, "Watershed", para. 2) gives the impression that a catchment is physically clear and hydrologically based. However, it does not offer any guidance on which watershed boundary is most useful for the purpose of management. Such a basic definition of a watershed or river basin could mean a small or larger size drainage area or several small catchments or river tributaries nested within a major catchment or river basin. It assumes that river basin or catchment boundaries are well-defined on surface water flow but this may not account and align with the groundwater resource (Del Moral & Do Ó, 2014; Moss, 2012). These authors emphasise that mapped hydrologic boundaries are constantly changing and so is our understanding of surface and groundwater resources though it may still be difficult to define the boundaries. Furthermore, Kerr (2007) claim although "watershed is a useful hydrological unit it is not a natural unit of human social organisation" (p. 90). As a result, choosing which watershed boundary to use is often as much a political act and choice as it is a scientific or natural one (Blomquist & Schlager, 2005; Warner et al., 2008). Schlager and Blomquist (2000) added, drawing boundaries are the first steps in defining decision makers i.e. who controls what, who gets what, and how will water be affected, all these types of questions and decisions will arise. This indicates that different boundaries imply different decision makers and different effects upon resources and people.

- **Accountability**

Ensuring accountability of decisions made at the watershed scale is seen as the function of the process and the degree to which participants and agencies are involved in the decision making procedures. Accountability of decisions made at the catchment scale is a challenge especially

when catchment boundaries are not aligned with electoral administrative boundaries. For example Sneddon (2002) discusses how the local communities of Nam Phong basin in Thailand, argue that the government representatives who were involve in the management of the basin respond and relate only to their jurisdictionally defined constituency rather than the catchment scale. This has caused tensions in the management of the basin.

- **Public Participation**

Public participation and empowerment becomes challenging to implement when local communities are encouraged to partake in decision-making but higher government authorities have not loosened their control on decision making. Local groups are discouraged as they have limited or no power and authority to carry through decisions which they might collectively make. For example Norman and Bakker (2009) argue that despite significant rescaling of transboundary water governance between Canada and the United States the process has not allowed the devolution of nation-state power down to local actors, which disempowers local actors.

- **Asymmetry between watershed and policy-shed**

No single policy or set of policies can entirely include the catchment area as most of the policies developed are at different levels. This often leads to overlapping legislation and policies can result from irregularities between watershed boundaries and administrative boundaries and scales (Cohen, 2012; Cohen & Davidson, 2011). Similarly, Schlager and Blomquist (2000) agree that boundaries are usually "multiple, overlapping and often contested by people on the ground" (p.16). As a result people try to deal with a mass of difficulties and situations that vary in scale and level from the local to national. Schlager and Blomquist (2000) discuss an example from Colorado, in which water districts were created with a Water Commissioner for each district. The role of the Water Commissioner was to record the right of each water user in the district and to see that those rights were satisfied according to the prior appropriation doctrine on behalf of the district's water users. Because multiple districts shared a single river, a conflict emerged between districts. A Water Commissioner in one district could not order users in another district to stop diverting water, even if such action was necessary in order to satisfy the water rights of everyone. Following that conflict, the state legislator established a watershed boundary over water districts and created the position of watershed engineers. The Water Commissioners were ordered to follow the directives of the engineer who was authorized to coordinate the prior appropriation doctrine across districts in a single watershed. Occasionally, Water Commissioners would refuse to recognize the authority of the engineers and disobey the orders.

- **Asymmetry between watershed and problem-shed**

Additionally, catchments are frequently impacted by issues or problems outside of watershed boundaries such as climate change, invasive species and the impacts of human activities (diffuse nutrients and sediment losses from land use change and agriculture industry pollution discharge) (Cohen & Davidson, 2011; Davidson & de Loë, 2014). These issues illustrate that no single boundary can encompass the diversity of activities and problems in a catchment and they highlight the limitations of uncritically accepting the catchment and its boundaries as the natural governance or management unit for water.

Other authors argue that there will always be boundaries such as physical boundaries between surface water and groundwater at different geographical scales; administrative boundaries between different countries and government levels; social boundaries between different social groups and between these groups and government and cognitive boundaries between different disciplines (Mostert, Craps, & Pahl-Wostl, 2008). Falkenmark, Gottschalk, Lundqvist, and Wouters (2004) argue that the key to IWRM is cooperation across these boundaries through the approach of social learning and creating opportunities for actors and stakeholders to participate and share their views and knowledge. However, if social learning and participatory approaches are to succeed they need to be undertaken with an understanding of what scales and levels are at play. While there may be ways to improve, Moss and Newig (2010) argue that water management and governance is a domain that is predominantly sensitive to issues of scale because the catchment, with its different scalar levels from small catchments to large river basins plays such a prominent role and is potentially subject to socially constructed and contested scaling units of governance.

3.4 Justification for the use of the concept of scale

In the past natural resource management was failing and amongst natural resource managers and practitioners there was a need to identify ways in which social-ecological systems could be harmonized and managed in an integrated way. As shown in chapter 2, the GoS has turned to the IWRM framework to plan, govern and manage water resources in Samoa.

Through this framework, the integrated management of land, water and other natural resources is seen to fit within the physical boundary of the catchment because it is obviously natural and that interactions of or between people and the environment, occurs within the catchment. Therefore, the utility of catchment areas as a management and governance scale or unit which has been used as the cornerstone for IWRM requires exploration.

The central dilemma here is that it makes sense to manage water resources based on hydrologic catchment boundaries due to their apparent natural character as a unit or connected

system. However, the challenge is that the catchment is not just a simple spatial unit but a very complex one with its natural characteristics as nested entity and interconnected unit. Humans have established socio-cultural institutions and practices over eons that do not align with these hydrologic boundaries. Correspondingly humans and nature are inseparable; they are harmonised together in complex systems. If catchment scale is chosen as the appropriate scale to make decisions, development of plans and policies, then ideally challenges or issues will occur or emerge because there are many interactions across-scales and across-levels. To overcome these challenges in water resource management and governance, it is important to understand that catchments are complex systems and there may be issues from using hydrological boundaries over existing social and administrative boundaries. Through the lens of scale, ecological and social processes extend across scales and levels and because different scales have different dynamics, scale mismatches can and will emerge.

3.5 Summary

The conceptualization of scale in most of the reviewed literature highlighted it as a useful concept that needs further in-depth analysis. The issue of scale mismatch is prominent and important for how it can complicate water management and governance. It is undoubtedly true that the catchment management is a useful idea in addressing cases where issues are hydrologically defined such as flood plains or simply because of the catchment natural features in terms of surface water flow. Moreover, catchment based management has been widely promoted and adopted via IWRM.

However, there are challenges in using the catchment as the unit of water management and governance i.e. boundary choice, accountability, public participation and asymmetries with problem-shed and policy-shed. While these challenges are somewhat common in other places, the ways to deal with them are context specific. For example, Samoa is a developing country with limited resources and heavily reliant on overseas organisation such as European Union (EU) for funds and aid to assist the water services developments (e.g. water supply, health, and environment). Embedded within the aid and funding guidelines are the principles of IWRM. Without any choice, Samoa is expected to follow these guidelines. Problematically, there is limited institutional capacity within government ministries to comprehensively examine how local people understand and interact with the catchment scale governance and management of water resources. This research will address these issues by discussing with local communities their perceptions of the catchment management approach.

Chapter 4 – Methodology

4.1 Introduction

This study adopts a social qualitative approach in its data collection and analysis methods. This chapter outlines how the research was carried out. Primary data has been collected from focus groups within two villages of Apia Catchment, and semi-structured interviews with staff members of relevant government agencies involved in the Water and Sanitation Sector programmes. Data was collected between the months of November 2014 to January 2015. At the same time, additional information was also accessed from government and non-governmental reports, legislation, policies and plans.

4.2 Research Aims and Questions

As stated in Chapter 1, the aim of this research is to investigate the implementation of the catchment management approach in Samoa by examining community perceptions using Apia Catchment as a case study. To meet the objectives of this study outlined in Chapter 1 the following research questions have guided the research:

1. How have catchment boundaries and approaches been adopted and applied in water governance and management in Samoa?
2. How do communities in the Apia Catchment perceive, interact with and contest these catchment boundaries and approaches?
3. What are the challenges that arise from or for the current implementation of catchment management in Apia Catchment and more broadly in Samoa?

4.3 Research Methodology

Walter (2006) describes a research methodology as the theoretical lens, methods and tools through which research is designed and conducted. With the intention of assessing how catchment management has been implemented in Samoa and how communities perceive and, interact with this approach in water governance, a research methodology is required to provide a descriptive, explanatory analysis of the perceptions of those involved. This research makes use of the case study method and thematic analysis to explore the data and documents of this study.

4.3.1 Case study research

A case study is one of many ways of conducting research. Authors like Stake (2009), Simons (2009) and Yin (2014) consider the case study as a useful means of examining contemporary phenomena in real-life situations. However, several other authors discuss different meanings of case studies and have raised questions about whether case studies should be considered a research method at all (Starman, 2013). Others, VanWynsberghe and Khan (2007) suggest that the case study is not so much about the case revealing itself as it is about the unit of analysis being discovered or constructed, meaning that researchers cannot definitively state the unit of analysis at the beginning of the research; it must come into focus as the research progresses. While recognizing divergent views, this research uses the case study as a research method following its description by Yin (2014) as an "empirical inquiry that investigates a contemporary phenomenon in depth within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 16).

Yin (2014) emphasises that the case study is well suited to examining 'why' and 'how' research questions, since it allows a deep analysis of the context, actors and interactions within a geographical location. According to Simons (2009) one of the strengths of the case study compared with other methods, such as survey and experiment, is the potential to engage in-depth interactive dialogue with participants' in the research process. In addition, Rowley (2002) mentions that the case study method allows triangulation i.e. evidence for a case study can be collected from multiple sources, assisting the researcher to understand the intricacies of the case and engage more with them. In contrast to surveys, although the number of units studied is greater than for a case study, the extent of the detail is more in-depth is a case study. In comparison with an experiment, case study research has little control over the variables or events when investigating a situation (Schell, 1992) which is embraced rather than externalised. On this basis, a case study approach was so chosen as the most suitable research methodology for this study.

4.3.2 The 'case'

In 2008, the GoS passed the WRM Act which adopted the IWRM framework as the guiding principle for water management and governance. The WRM Act is being implemented through each individual Watershed Management Plan and catchment by-laws as part of community engagement and involvement in water resource management (Part VIII & Part XI of the WRM Act 2008). To support the mainstreaming of IWRM into the new framework, in 2009, the Apia Catchment was chosen as an IWRM national demonstration pilot project site to be focused on catchment management issues. This project it underpinned by the catchment scale approach. Hence, the case is 'catchment management in Apia Catchment'.

The aim of the IWRM project was to "develop and implement a set of strategic actions such as zoning critical land areas and rehabilitate deforested land in order to improve the quality and quantity of water" (Ministry of Natural Resources and Environment [MNRE], 2007b, p. 5). The Apia Catchment provides an example of an attempt to address water management and governance issues through IWRM which advocates the catchment as the most appropriate scale and level for defining management and governance of water resources, as well as the administration of water-related organisations and local communities. This case involves a complex set of spatial and administrative scale interactions with significant challenges in water resources management and a range of interconnected water users involved. Through the implementation of this project, the Water Resources Division (WRD) is institutionalising catchment boundaries through setting up Catchment Committees and by-laws. The water management and governance in the Apia Catchment provides a useful case for examining how catchment scale management has been adopted and how villages perceive this approach to water management and governance. A case study method allows a deep analysis of this context and is well suited to examining actors (water users) and interactions within a spatial location (Apia Catchment) (Yin, 2014).

4.3.3 Study Sites

The Apia Catchment is an urban catchment area (named after Samoa's capital city) located on the island of Upolu. It encompasses three administrative districts i.e. Faleata West, Faleata East and Vaimauga West (Figure 4-1), which consist of approximately 83 villages and an estimated population of 54,987 people i.e. almost 30 per cent of the total population of the country.
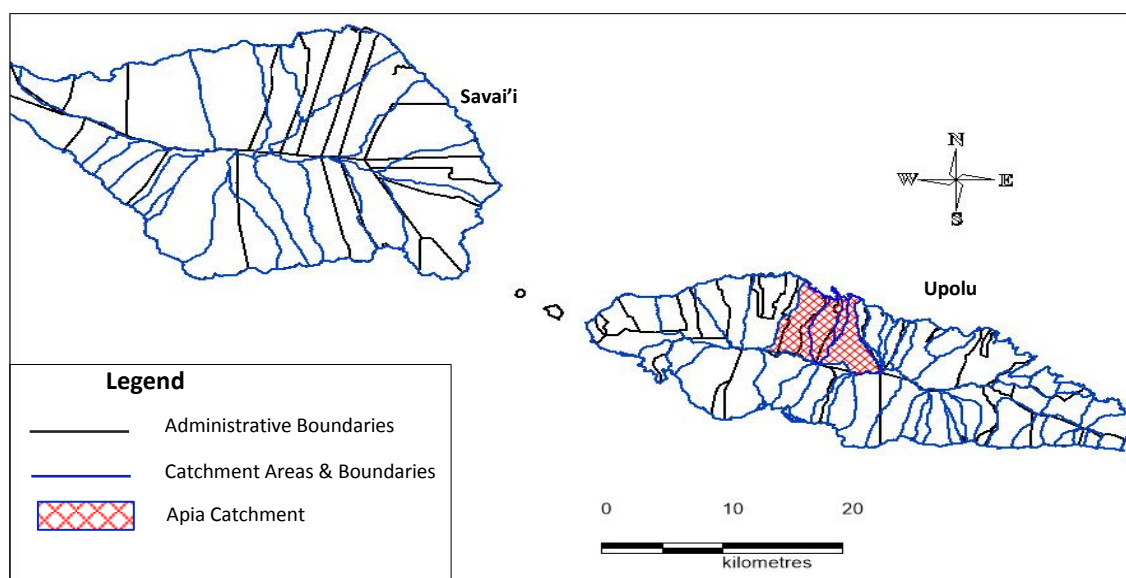
Figure 4-1- Samoa's administrative boundaries for voting and electoral
Source: Author compilation using GIS layers from MNRE

The Apia Catchment consists of four water management sub-catchments namely, Vaisigano, Loimata o Apaula, Gasegase and Fuluasou (Figure 4-2) with a total land area of approximately 115.15 square km including Lake Lanoto'o on the upper ridges of the catchment (MNRE, 2012, pg. 26). Lake Lanoto'o is one of Samoa's national reserve areas protected under the Ramsar Convention because of its significant biodiversity value. As discussed in section 2.2.1, the climate of the island is seasonally dry and wet and because Samoa is a small island, the climate is virtually the same around most areas of the island including Apia Catchment.

Of these four sub-catchments, Vaisigano and Fuluasou are the sub-catchments most prioritized by the government because these are the main sources of drinking water supply for the city, urban settlers who live in Apia Urban District and extra areas between Apia and the west side of Upolu island (MNRE, 2007b).This is a population of over 90,000 people (which is almost 50 per cent of the country's population) (MNRE, 2012).
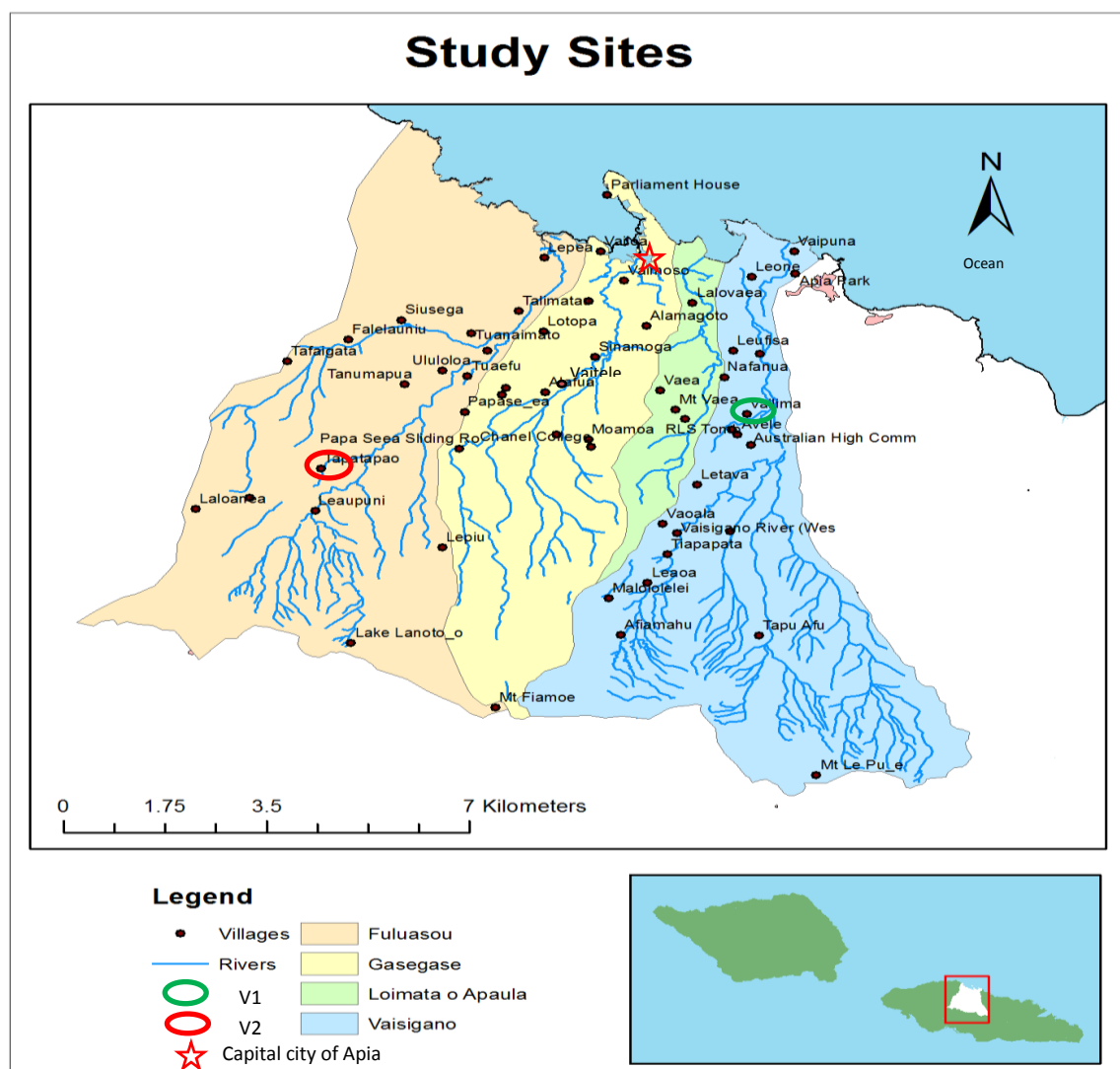
Figure 4-2- Apia Catchment Area- the selected villages are circled
Source: Author compilation using GIS layers from MNRE

Samoa Water Authority (SWA) operates four water treatment plants; two in Fuluasou and the other two in Vaisigano, collecting surface water in the Apia Catchment. There are also two hydro-power stations managed by Electric Power Cooperation (EPC) which are located in Vaisigano sub-catchment. As discussed in section 2.2.4, 80 per cent of the total land area on the island is customary owned. Therefore the planning and development of land is vested with the villages. This has put pressure on the water resources as unsustainable development increases in areas of Apia Catchment. Over time, there have been a series of water quality and quantity problems in Apia Catchment and these have been well documented since the 1990's. The key problems include land use impacts, sediment loads, flooding in the lowlands, invasive species and anticipated climate change and climate variability conditions. The area also has a history of shifting cultivation and agriculture production, mainly of cash crops such as taro, banana and coconut contributing to the water quality problems arising from sediment movement from erosive areas (MNRE, 2013).

Focus groups were held in two villages of Apia Catchment namely, Vailima (V1) and Tapatapao (V2) (Figure 4-1). Based on WRD reports these villages were involved and have participated in community consultations conducted by WRD on the development of catchment by-laws and watershed management plans (WMPs) during the IWRM demonstration project (2009-2013). Therefore, these villages would be expected to have knowledge of catchment management. The two villages have similar land ownership (mostly communal land), a mix of land uses (agriculture and housing developments) and both villages are supplied from surface water intakes in the upper ridges of Apia Catchment. Furthermore, both villages have Water Committees but only V1's committee is in active. These water committees consist of the village mayors and four to six high chiefs several untitled men selected by the village council to maintain their water systems.

4.4 Methods of Data Collection

This research makes use of three data collection methods: semi-structured interviews and focus groups discussions to collect primary data as well as document analysis to gain an in depth understanding of the context and supporting evidence for the data collected. Interviews and focus group sessions were recorded with a digital recording device. In addition, observation notes were taken during sessions as reminders of emerging issues and themes for analysis afterwards.

4.4.1 Semi-structured interviews

Interviewed participants were recruited through formal networks. For the semi-structured interviews, a request letter and research information sheet were sent to the relevant government ministries to obtain their consent to interview one of their staff members who is closely involved

with water related programmes and projects. When consent was obtained from the Chief Executive Officer (CEO) of these organisations for one of their staff members to participate, a guideline of questions, a research information sheet and consent documents were sent to these selected staff via email and hardcopies. Although, the response from the emails was relatively limited, nevertheless, a total of eight participants showed willingness to be involved and were interviewed (Table 4-1).They represent government ministries, non-government organisation and state-owned enterprises. Attempts were made to contact other relevant NGOs' (Samoa Umbrella for Non-Government Organisation (SUNGO) and Samoa Red Cross, Plumbers Association). However, staff members were unavailable for interviews. Other relevant government ministries that are also involved in water resources management activities such as Ministry of Health (MoH) and Ministry of Works, Transport and Infrastructure (MWTI) were contacted but no feedback was returned. Because interviewees are specialised in different areas of water management and governance, more than one staff member from the same institution was interviewed. For example, from the Ministry of Natural Resources and Environment (MNRE), three participants were interviewed. The interviewing approach allows the study to draw on a range of perspectives to address the research questions.

Table 4-1 – Organisations represented by interviewees

ID CODE	Institutes	Role
P1	Water Resources Division (WRD), MNRE	MNRE is the leading agency responsible for the management of Samoa's environment and natural resources. The WRD is housed within MNRE and is the leading division responsible for water resources management and governance of Samoa.
P2	Watershed Section (WRD), MNRE	
P3	Water and Sanitation Sector Unit, MNRE	Water and Sanitation Sector Unit is another division within MNRE that oversees and coordinates all the activities for the individual agencies under the Water and Sanitation Sector (refer to Figure 2-3)
P4	Ministry of Agriculture and Fisheries	MAF is responsible for promoting agriculture, livestock and aquaculture developments in the country.
P5	Samoa Water Authority	SWA is responsible for the water supply services, providing water for over 80 per cent of the population and sewage services for Apia Urban District commercial properties only.
P6	Electric Power Corporation	EPC is responsible for energy supply including hydropower generation for the whole country.
P7	Independent Water Schemes Association (IWSA)	IWSA is a registered NGO with its main role being to provide strategic advice and management to 33 independent water schemes that are not part of the SWA network system. The organisation was established under the EU WaSSP project 2008 and is housed within the MWCSD which also provides funding for the IWSA.
P8	Ministry of Women, Community and Social Development	MWCSD is the leading agency that facilitates community engagement and involvement. It focuses on, sustainable economic development initiatives between government and communities, promoting good governance principles in order to strengthen social and economic development at the community level.

4.4.2   Focus Groups

Kitzinger (1995) discusses the focus group method as being useful when exploring people's knowledge and experiences but is more likely ideal as it reveals people's commonly-shared interactions and views of a specific topic, in this case, catchment management within an explicit setting. Although individual interviews could have been conducted with community members, according to Morgan and Krueger (1993), focus groups enable the researcher to gain a larger amount of information within a shorter period of time. Also they are useful in situations where there are power differences between the participants and decision-makers which is the case in Samoa, the country having a strong cultural and traditional hierarchical status of villages that is very important to sustain. Therefore, the focus group method was seen to be appropriate.

The aim of the focus groups was to explore community perspectives on how water is governed and managed within and along the currently designated catchment boundaries. The focus groups were conducted in one of the villager's fale (house) and set up in a traditional way to allow the community members to feel comfortable within their own local setting. Three target groups, namely high chiefs (Matai), women (Faletua ma Tausi) and untitled men (Aumaga ma Tupulaga), were chosen based on the traditional community hierarchy and cultural setting. Additionally, this design was used in order to see if there was a difference in the perceptions of the target groups with regard to catchment management. Questions were outlined for each target groups' session however, not all questions were answered and discussed due to cultural concerns. Nevertheless, the dialogue between participants was open and very fruitful.

The focus group participants were recruited with assistance from the Ministry of Women, Community and Social Development (MWCSD) and village mayors. Firstly, I requested the assistance from the MWCSD through the Internal Affairs Division to obtain information on the village mayors and other contacts. After obtaining this information, I contacted the village mayors (pulenuu) and they were very happy to assist with the research. However, before any focus group could be contacted in the villages I had to go through traditional customs i.e. the ava (kava) welcoming ceremony to obtain consent from the village council (fono a le nuu). These cultural protocols are important but required extra monetary resources which were beyond the allocated budget for this study. However, thankfully this was no issue for this research as the chosen village mayors briefly explained to the village council that this is a student project, so they agreed and allowed me to conduct the group discussions.

The village mayors (pulenuu) of V1 and V2 assisted in contacting participants for the focus group sessions (Table 4-2). The village participants were selected by using the snowballing method[7] i.e. having the village mayors recommend participants from the families within the villages.

Table 4-2 – Focus group participants from the two villages

Sub-Catchment	Villages	Target Groups	Group Code (GC)	Number of Participants
VAISIGANO	V1 (Vailima)	Matai (High Chiefs)	V1-Chiefs	7
		Faletua and Tausi (Women)	V1-Women	8
		Aumaga (Untitled Men)	V1-Untitled Men	8
FULUASOU	V2 (Tapatapao)	Matai (High Chiefs)	V2-Chiefs	6
		Faletua and Tausi (Women)	V2-Women	7
		Aumaga (Untitled Men)	V2-Untitled Men	9

The focus group sessions started with a brief overview of the research aim and questions. These, were translated, printed and handed out to the participants. For each target group, effort was made by the village mayors to have at least one member from each household. For example, in the womens group, Faletua ma Tausi are high chiefs' wives, but are not married to the matais' selected for the high chiefs target group and vice versa. The number of focus groups was not intended to represent the entire communities of Apia Catchment, but within these target groups they reflect a range of particular situations within specific contexts involved in implementing catchment management activities. Their discussions provided insights into the many diverse implications of the catchment scale management in water resources governance and how communities are responding. The data represented are anticipated to illustrate a general overview of all the target groups' and perceptions on each developed themes, but not to be taken as individual perceptions, unless specified.

4.4.3 Document Analysis

Additional information was collected from government legislation, reports, policies, plans and articles. The documents were reviewed to provide context, a chronology of events and validate the information collected from the interviews and focus group sessions.

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[7] Snowball sampling is a non-probability or non-random sampling technique that is used to identify potential participants or subjects in studies. In this method the researcher asks assistance from one of the participants to identify other candidates interested for the research (Morgan, 2008).

4.5   Data Analysis

Each session and interview was personally transcribed and exported into NVivo 10 Software to assist the analysis. These documents were stored in a password-secured computer. Since most of the sessions especially the focus groups, were conducted in the Samoan language for easier communication with the communities, transcribing took much longer than anticipated. All participants were asked whether they wanted a copy of their interview transcripts before it was analysed but none accepted the offer.

4.5.1   Thematic Analysis

Thematic analysis is a widely-used qualitative data analysis method that focuses on identifying patterns (i.e. themes) across a dataset to provide answers to research questions being examined. As such, it organises the data to draw out significant findings in vast data sets. This method of analysis was assisted by Nvivo10 Software.

4.5.2   NVivo 10 Software

Before exporting the transcripts to Nvivo10 software, the coding process was done manually. Transcripts were printed out and codes were written on the margins, I also used different highlighter pens to represent each theme. The themes were reviewed several times through careful data familiarisation, revising them repetitively and cautiously, some were extended while others were merged together into final themes for example collaboration and participation.

To explore the data further, all the transcripts were exported to NVivo 10 software. According to Lavery and Butler (2013), the conceptualization of data through coding helps identify patterns and interpret the views and opinions of the participants as discussed during the interviews and focus groups. Identifying the key themes helped to explore perceptions of the target groups of both villages and stakeholders involved, thus enabling me to obtain results and draw conclusions. Informed by the research questions, nodes were generated to organise the data. The coding process involved examining and sifting through the data and identifying themes, topics, ideas, concepts, phrases or keywords, and then each piece of text was marked with a code and later retrieved to group data into themes. After the coding process, all coded sections of data for individual nodes were exported into one Word Document to allow a visualisation of stakeholders' and community groups' responses and developed themes, in relations to the research questions.

4.6   Human Ethics

This research was approved by the Human Ethics Committee of the University of Canterbury on 12th November 2014. Before the start of any interviews and focus group discussions, participants were informed of their participatory rights and anonymity. The research information sheet (Appendix 1) and Consent Form (Appendix 2) were provided and signed before any session was conducted. To ensure that participants' anonymity and privacy were protected, their names were translated into identification codes with all the related information collected and maintained using pseudonyms within transcripts and thesis write-up. Furthermore, participants were free to withdraw from the study up until the 18th January 2015 before the data analysis started. The information and data collected were securely locked in a password-locked computer. The only persons who had access to this information were the researcher and supervisors.

4.7   Reflection on my position in the research

I am a full-blooded Samoan woman with a sa'o tamaitai title, born and raised in the islands. Before pursing my current studies, I worked in the Water Resources Division [WRD] as a Senior Water Policy Officer for the past six years. These milestones of my life have shaped the way in which I approach and conduct this research. So, what is clear is that I have some experience and knowledge of the water resource management and governance issues within our small island. Although I have worked within the field, it should be noted that I am both an 'inside and outside observer' of water resource policies implemented by the GoS affecting the local communities. I am an 'inside observer' in the fact that I am Samoan and speak the language fluently, have cultural ties, and have previously worked for WRD. My positionality as an 'insider' therefore provided an opportunity for me to engage more with the villagers and gather data that may have been less accessible for an 'outside observer'. However, being a student researcher, from New Zealand university, I am also an 'outsider observer'. This aspect of my positionality caused some community participants to view me as government staff, particularly because of my previous work. This perception of the community about me created an expectation that there should be a kava ceremony with monetary gifts. Although, these are important dynamics to Samoa's culture; nonetheless, thankfully, the village mayors explained to the village council that this is a student project, so they allowed me to conduct the group discussions without any cultural obligations. Overall, this study hopes to provide a link between policy developers at the national level and local villages.

4.8 Research limitations

This study has faced several constraints; firstly, for the focus groups. I believe my inexperience as a professional facilitator in facilitating a focus group session mirrors through the group discussions, because although there were focused questions prepared for each target group, the sessions were always diverted to some unrelated topic. Some participants dominated the discussions while others felt reluctant to share their views, due to several reasons such as cultural circumstances. For example, the women's groups did not want to answer questions related to decision making within their villages because they think it is not their role, emphasising the cultural roles of high chiefs (matai) as decision makers. Furthermore, the focus groups sessions were either carried out at one villager's place or the village mayor's fale (house). In some cases, mostly during the womens group sessions, participants brought children which caused distractions. Therefore, some sessions took longer than expected; nevertheless, sessions were productive.

This study only looked at two villages of the Apia Catchment and it is important to note that a comprehensive study of local community perceptions would only be feasible if more villages were able to participate in order to provide a greater level of detail into the perceptions of the community towards catchment approach and how the government is implementing it. However, this was not feasible due to time constraints and the resources available for this research. Although initially four villages (two upstream and two downstream) were proposed and chosen to conduct the focus group sessions, only two villages (V1 and V2) were able to participate. The reason for the primary design was to examine how community perceptions of catchment management vary geographically between upstream and downstream areas. That seemed relevant considering that most of the catchments' upland land areas are community-owned and the downstream are privately owned. However, one village (V4) pulled out at the last minute due to some cultural obligations held in the village, while the other village (V3) only had members for two target groups (women and untitled men attended but no high chiefs). As a result a decision was made by the researcher and supervisors that those focus groups would be left out, in order to rule out any inconsistency in comparison of the target group perceptions.

In addition to those constraints, snowball sampling was the used to recruit participants for the focus groups. The village mayors (pulenuu) of V1 and V2 recommended and assisted in contacting participants for the focus group sessions. Although this was efficient, this sampling method has an inherent preconception i.e. the village mayor can recommend and recruit people he prefers or only recommends his family members. In the latter case, this would have reduced other potential perspectives and the extensiveness of the results can be influenced by this to a certain extent. Nevertheless, an enormous effort was made by village mayors to have at least one

member from each household to involve in the focus groups and this effort was greatly appreciated.

For the semi-structured interviews with government officials, the time of the data collection i.e. during the festive seasons was also another contributing factor, because most of the government officials were in a holiday mood and it was quite challenging as some staff members took a long time to confirm their availability. Some participants kept postponing their confirmed time due to meetings and other commitments while others confirmed times and arrived late. These situations caused delays in the data collection process. Furthermore, in terms of the document review, documents that were available were only limited but some were misplaced while others did not exist at all, only by the word of mouth. For example, the report on how the new catchment areas and boundaries were drawn was not available.

4.9 Summary

This study adopts a social qualitative approach based on a case study to examine the perceptions of the key agency personnel (government and NGO) and those of villages involved in the implementation of policy that deploys a catchment scale approach to water management and governance. Semi-structured interviews were undertaken with government ministries, NGO and SOEs and focus groups were conducted with target groups of two selected villages within Apia Catchment. Additional information was collected from legislation, reports, policies, plans and articles of relevant organisations. The documents were reviewed to validate and complement the information collected from the interviews and focus groups and to establish a chronology of events to provide support in establishing the context for the case study. The interview and focus group data were evaluated using a thematic analysis which focused on identifying patterns to draw research findings.

Chapter 5 – Government and NGO Perspectives

5.1 Introduction

This chapter presents the results from government documents and semi-structured interviews with government and NGOs' representatives. It has been divided into two sub-chapters:

- Sub-chapter 5.2 presents a brief history of the catchment management approach in Samoa derived from the document review and interviews with government personnel.
- Sub-chapters 5.3 and 5.4 present themes derived from interviews with government personnel and organisations' representatives on the implementation of catchment management.

5.2 Background context of catchment approach implementation

This section sets out a brief history of the catchment management approach in Samoa, and how catchment management was introduced to the Apia Catchment. Its implementation is the core function of the Water Resources Division (WRD) of the Ministry of Natural Resources and Environment (MNRE).

5.2.1 The origin of catchment management

According to the State of the Environment Report (Taule'alo, 1993), the first hydrology map for Samoa was created by Kear and Wood of the New Zealand Scientific and Industrial Research Centre in 1959. Following that study, Kear, Kammer and Brands (1979) of the then New Zealand Department of Scientific and Industrial Research conducted a comprehensive study of the hydrogeology and water supply of the islands and initiated the division of the islands (Upolu and Savai'i) landscape into 28 distinct hydrological zones (Figure 5-1). As representative drainage areas, they were to provide basic information about the physical hydrology of Samoa's landscape for use in planning, resource management, and environmental monitoring (Kear et al., 1979).
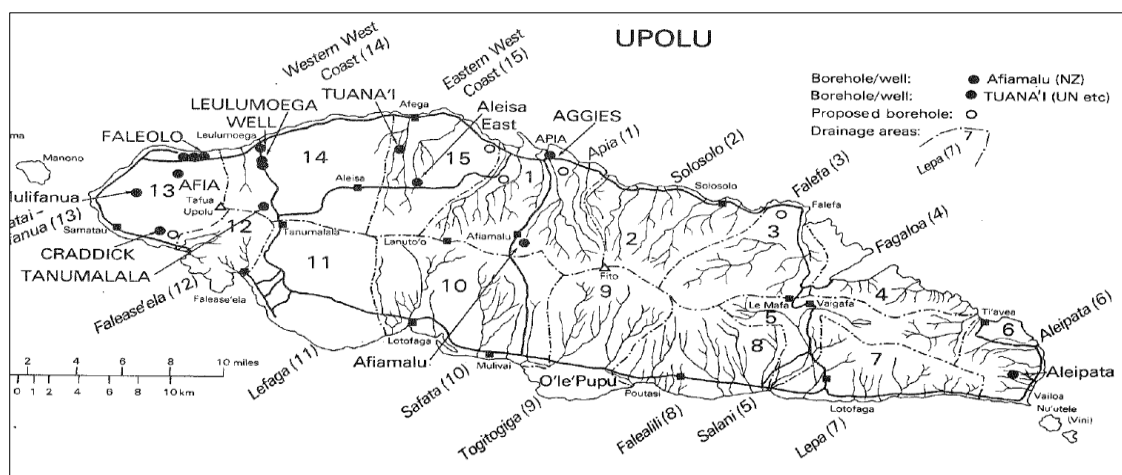

**Figure 5-1- Drainage area divisions of Upolu island**
Source: (Kear, Kammer, & Brands, 1979, p. 61)

According to Rowe (1994), in the early 1980s Samoa encountered serious issues of flooding, sedimentation, deforestation and dried-up rivers especially in catchments that supply drinking water and are a source for hydro-power. These issues were further specified in a watershed condition inventory report carried out in 1983 by Nelson. This raised serious concerns about water degradation and future supply, and led the Food and Agriculture Organisation (FAO) representative in Samoa at the time to report the situation to FAO headquarters (United Nations) in Rome. The representative requested assistance along with a proposal for the establishment of a Watershed Management Section under the Forestry Division of the Department of Agriculture, Forests and Fisheries (now called MAF) (Baisyet, 1989; Rowe, 1994). During that time there was no government agency that was fully responsible for water management and governance, specifically catchment management. Although some departments such as EPC and the Public Works Department (now called MWTI) were engaged in aspects of water resource utilisation, none were involved in the protection and management of water resources. Most of the departments were utilizing the water resources to the maximum level required without considering the resource sustainability (Baisyet, 1990). In 1990, a Watershed Section was established within the Forestry Division and FAO initiated the first watershed pilot project in Vaisigano catchment aimed at promoting integrated watershed management by involving villagers in the sustainable use of upland resources, mostly foresting for timber production (Rowe, 1994). However, in 1990 and 1991 cyclone Ofa and Val hit the islands causing destructive impacts to the catchment areas particularly to the forest cover resulting in the formation of landslides and an increase in sedimentation and flooding (Baisyet, 1993). Following these disasters the country received technical and financial assistance from donors such as FAO and UNDP. With these resources, the GoS made an initial attempt to manage catchment areas through the development of the Watershed Protection and Management Regulation 1991, established and enacted under the direction of the Water Resources Management Act 1965.

5.2.2   The institutionalisation of catchment management

Institutional reforms were carried out (refer section 2.3) in 2006 when the Water Resources Division (WRD) was setup within the MNRE to oversee the management and governance of water resources in the country (MNRE, 2012). This institutional reform was partly grounded on the need to reduce the strong agricultural–forestry orientation of watershed activities that occurred under what is now Ministry of Agriculture and Fisheries (MAF) and to promote IWRM. With increased environmental degradation and cumulative trends towards higher demand and a diminishing supply of water resources, issues persisted. To address them, in 2008 the GoS passed the WRM Act which replaced the Water Resources Management Act 1965 and the Watershed Management Regulation 1991; Samoa's 2008 WRM Act adopted the catchment

management approach through the IWRM framework as the guiding principle for water management and governance. The aim of the catchment approach in the WRM Act is to ensure that water is utilized in a sustainable manner guided by the establishment of Watershed Management Plans (WMPs) and catchment by-laws as part of community engagement and involvement. In 2006 to 2010 a volunteer Engineer from Australia worked with WRD and as a result new updated catchment boundaries (Figure 5-2) were drawn and compiled into a GIS mapping layer; hence, Samoa was sub-divided into 65 catchment areas. Subsequent to the drawing and delineation of the catchment areas and boundaries WRD called for the establishment of Catchment Committees for each catchment. The overall aim of these Catchment Committees is to assist MNRE with the enforcement and monitoring of catchment by-laws and WMPs for each sub-catchment. Representation on these committees is required to consist of village mayors and women representatives from each village within the catchments.
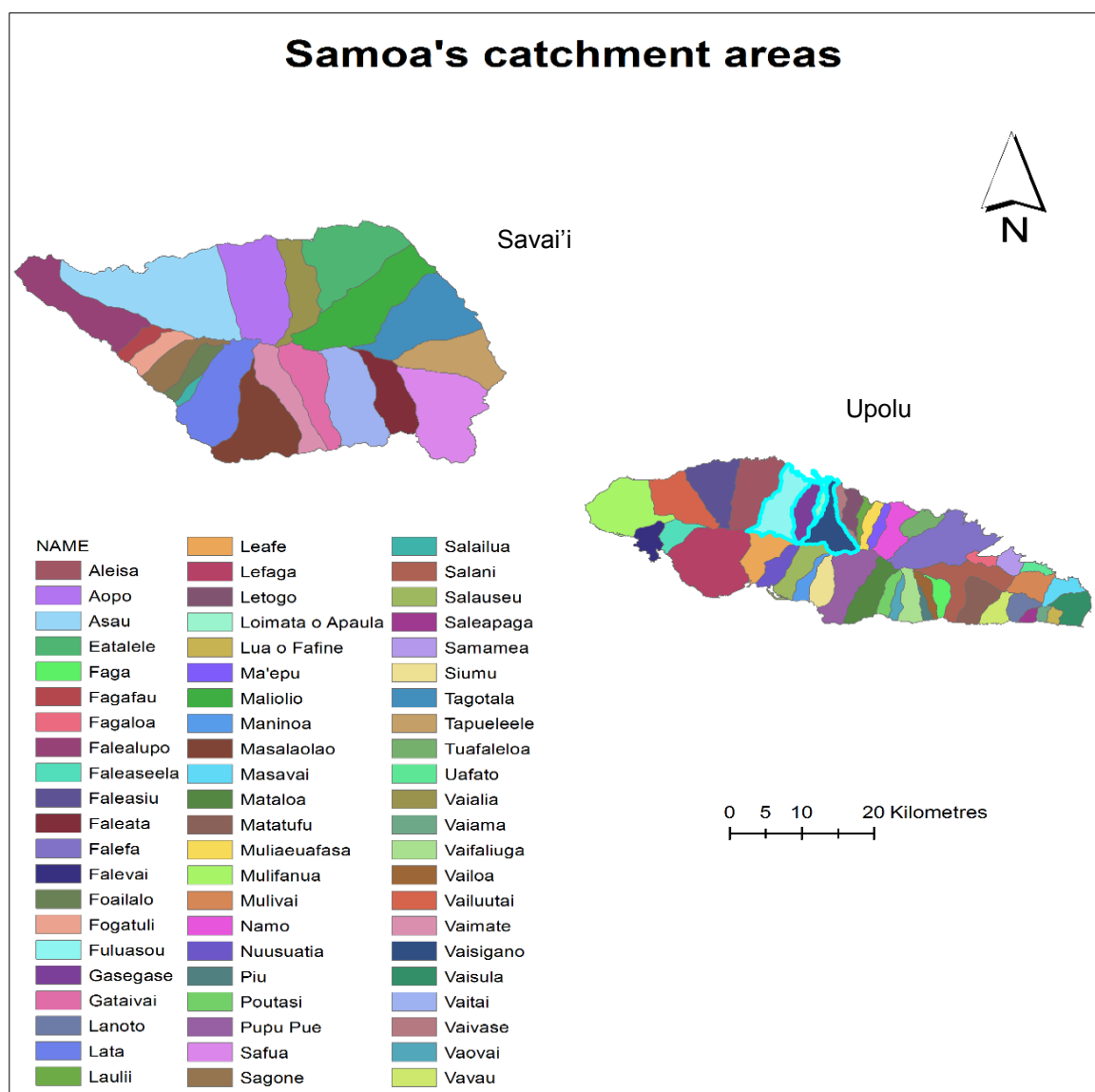
Figure 5-2- Current division of catchment areas in Samoa
Source: Author compilation using catchment GIS layers from MNRE

MNRE participants [P1,P2,P3] felt that establishing Catchment Committees for Apia sub-catchments would be a positive step forward in the management of water; other participants also supported this expectation [P4-MAF,P5-SWA,P6-EPC,P7-IWSA,P8-MWCSD]. These Catchment Committees were planned to be established during the implementation of Apia Catchment-IWRM Demonstration Project funded by GEF, UNDP and UNEP in 2009 but were delayed and are yet to be formally established [P1, P3].

During the IWRM Demonstration Project, four WMPs for each sub-catchment have been developed whereas catchment by-laws are still in the process. Furthermore, government officials commented, "there is no recent official written report on the updated catchment areas and boundaries" [P2] and the "current catchment layers and boundaries have not been legally defined and verified" [P1]. An MNRE respondent maintained that WRD is currently working on that aspect for catchment management and governance however, it is likely that "these layers [catchment boundaries] will surely change again in the future when more advanced information and technology is available" [P2]. Despite this, all Water Resources Division (WRD) work is based on these catchment boundaries such as the rehabilitation and replanting of degraded areas, placement of hydro-monitoring stations, the development of catchment by-laws and watershed management plans (WMPs).

5.2.3   The current on-ground implementation

Rehabilitation of degraded areas with native trees was mentioned by government participants as one of the major catchment management initiatives that the Watershed Section of the Water Resources Division has been carrying out. As a result of efforts of the IWRM demonstration project, the GoS has committed to purchase communal and freehold land that is considered critical in the upper ridges of Apia Catchment. So far, 82 acres have been purchased of which 32 acres have been replanted and fenced off using a community engagement approach. WRD has engaged community-based society groups such as churches for the implementation of these replanting initiatives [P1, P2]. These areas have been degraded due to deforestation and unsustainable developments of housing and agriculture in previous years.

An ongoing monthly maintenance programmes by the Watershed Section has been implemented to ensure a sustainable management of these rehabilitated areas. A further 120 acres of both private and communal lands have been surveyed for protection and rehabilitation; these areas are above the Samoa Water Authority (SWA) water treatment plant intake. The government hoped that declaring the top ridges of Apia Catchment as reserves and the purchase of the land from the Catholic Church (freehold land) will reduce the impact of upland developments of the catchment areas on river water quality and tributaries that supply the SWA water intakes and treatment plants.

Led by the IWRM Project, WRD have drafted the National Upland Watershed Conservation Policy to "promote the protection of the top ridges (600m from sea level) of watersheds to be excluded from any developments"(Global Environment Facility, 2014, p. 42). To date, this policy is still in draft form and has yet to be submitted to Cabinet for approval. It is believed that these initiatives and policy will lead to "positive outcomes including government purchase and designation protection of upland watershed areas to strengthen catchment management" (Global Environment Facility, 2014, p. 43). However, according to MNRE participants' implementation has had its challenges; these are discussed in the following section.

5.3 The ideal perspective and reasons for catchment management

To further examine its implementation, staff members from government agencies, non-government organisation and state owned enterprises (Table 4-1) were asked about their perspectives on the utility of the catchment approach. Several prominent themes arose:

5.3.1 Ridge to reef concept

There was a general understanding across all the participants that catchment management is part of the IWRM framework which embodies a ridge to reef management approach for water resources [P6-EPC, P7-IWSA].Participants described this concept by referring to Samoa as being a small island, therefore, whatever happens upstream will impact downstream [P8-MWCSD]. Also, two respondents from MNRE stated that the catchment management is not new and has been seen and use in Samoa for several years [P1, P3]. It was noted that only its implementation that has changed, referring to the times when the Watershed Section was previously under the DAFF (now MAF) when most of the catchment programs and activities were agricultural and forestry oriented; also at that time, logging was the major export earner for Samoa [P1, P2].

The interviews reveal that although there is a common understanding of catchment management, however, some participants felt that it was not their job to be concerned about it because it is not in their ministry or organisation's corporate services plan or under their mandated duties to implement [P5-SWA, P6-MAF, P7- IWSA, and P8-MWCSD]. Others mentioned that they are only interested in utilizing the water and do not see any implications of catchment management or boundaries on their duties. For example:

> ...we are only interested in getting the water from the river. The MNRE handles the catchment through their own management programs. We only encourage people not to cut down trees and things, but other issues with land and conservation we don't handle it. [P6-EPC]

The results show that it is mainly MNRE that advocates catchment management. Therefore, MNRE participants [P1, P2 and P3] were asked why the catchment approach has been adopted. Themes that emerged related to being natural and using it as a management tool, promoting local ownership, improving coordination between water users and it being easier compared to other boundaries due to its naturalness.

5.3.2 Holistic natural areas and boundaries are easier

Most of the respondents stated that managing at the catchment is appropriate due to the natural character of catchments as a single unit and the interconnectedness of various ecosystems (land, water, forest and sea) within catchments. Therefore, it was seen by participants as appropriate and fit for the purpose to manage and govern water because all people are included within these catchment boundaries.

> *Well because yes everything on land within catchments is connected naturally, I mean- water, land, sea and people. Samoa is a small island, so I know whatever happen on the top mountain areas will always influence bottom.*[P1-MNRE]
>
> *...so we got all the players involved including the communities, everything is connected the land, water, ocean. But by using of district boundaries I can see the difficulties in using them because there are rivers that cross these boundaries, for example River within Vaimauga East crosses Vaimauga West District. So I think catchment boundaries and scale is good. I think using the catchment boundaries is easier for monitoring river systems because it's natural. Even though there are many villages within these catchment areas, but I believe this [catchment] is easier* [P2-MNRE]
>
> *… I think catchment level or scale is very good, it is the right way to go, because we can't manage and be able to achieve most of what we expect at the national level. It's too high!* [P3-MNRE]

It can be seen that participants identified with the naturalness of the catchment and presumed it easier compared to other boundaries such as district and village and the appropriate level compared to the national level, if used to manage and govern water.

5.3.3 A 'management tool'

When discussing the usage of catchment areas and boundaries, one respondent emphasised that the government is not imposing any boundaries on the village. Rather, "it was created to assist the management of water resources and allocations of government resources" [P3].Other respondents stated that the adoption of catchment management has permitted and enabled all water related agencies to come together under one Sector and has resulted in a much more integrated approach of different water users involved in water management issues and projects, such as IWRM demonstration project in Apia Catchment [P2, P3]. Overall, all MNRE interviewees believed that with a catchment-based approach there is a strong management framework in place for water [P1]. They also conceded that it is the enforcement that has always been lacking [P1, P2 and P3].

It's a lot more integrated, a lot more consolidated. Improve in the utilisation of available resources from overseas aid and fund.There's been a lot more emphasis or more targeted emphasized on community engagement.Whereas before, we did community engagement in various areas but mostly fragmented.Right now there is a more targeted, coordinated, and integrated approach to catchment management.So it doesn't just involve the ministry and community, we also working in partnership with other affected government agencies and the NGO's.I think in terms of governance and management frameworks, it's very solid; we got a very strong governance framework in place. [P3 - MNRE]

Generally, MNRE sees the catchment scale approach as a management tool that not only allows the managing and governing of water but furthermore an approach to bring all water users or agencies together under one Sector. Notably, this contradicts with other government ministries' and NGOs' perceptions of catchment management as not being their concern.

5.3.4   To promote 'local ownership'

Promoting local ownership of water resources management activities was a dominant theme that arose when discussing catchment management activities. Interviewees stated "we [the government] need to link more with the communities, because we want them to take responsibility for the management of the water sources within their villages" [P2]. Some respondents mentioned that the adoption of catchment management has involved the creation of proposed Catchment Committees for each catchment that will assist Water Resources Division (WRD) with the enforcement of catchment by-laws and watershed management plans for each sub-catchment.

… the reasons why we [WRD] push for the catchment scale is it promotes ownership amongst the local people .We are proposing for catchments committees. These catchment committees will consist of most probably 8-10 members including the village mayors [pulenuu] and the women committee representatives [sui o le malo] from each of the villages within the catchments. They will assist the ministry with the enforcement and they will be extra helping hands for the government... [P1-MNRE]

It can be seen that the government expects catchment committees will act as 'helping hands' towards the implementation of catchment management i.e. promoting local ownership amongst different villages. So, empowering the communities to help out with and take control of the issues such as deforestation, agriculture developments and other activities that can impact on water quality and quantity.

5.3.5   Financial institution directives

Conditions imposed under overseas aid funding was frequently mentioned as an important reason for adopting catchment management. For instance interviewees noted:

…with IWRM GEF project, there was money available so catchment scale management approaches such as rehabilitation, community consultations and replanting activities using youth members was convenient. But now the project is finish, so no more money! [P2- MNRE]

But it is very hard to push the household level or individual village approach to the financial institutions because they said their guidelines are strict to use the catchment scale approach. I think the financial institutions are looking at the benefits for the whole greater community. But if we tell them it is for the individual village or households, they would never accept it. So that is why it is so hard to get more money from overseas aid and financial institution... [P1- MNRE]

Participants confirmed that alongside money available from overseas organisations such as Global Environment Facility (GEF) and the European Union (EU), catchment management has been a condition of this funding and aid. Participants perceived it to be hard to change these financial institutions' requirements and they should therefore be followed in order to secure funds for the country.

5.4 Challenges faced with the implementation of catchment management

Notwithstanding the positive aspects of catchment management, most participants especially MNRE officials identified this level of management as very challenging to implement in practice. The themes identified were land ownership, lack of community willingness, costs in conducting community consultation and natural disasters. Other participants [P4-MAF, P5-SWA, P6-EPC, P7-IWSA and P8-MWCSD] also discussed these challenges despite their perceptions of catchment management as not their concern.

5.4.1 Land ownership

Land ownership was mentioned by all interviewees as one of the major challenges to the implementation of catchment management. With more than 80 per cent of Samoa's land being classified as communal land the protection, development and management of these land areas are vested with the villages. For example, a government official maintained that "catchment scale approach and management is very complicated especially when land is involved" [P2]. All interviewees felt that both private and communal land ownership has contributed to the increased encroachment of the upstream land areas as people continuously subdivide their land (freehold) and sell it, while other people continue to develop it through farming and agricultural plots.

…one of the main challenges that Apia Catchment faces is the encroachment of upstream. There is no control of downstream villages on what is happening upstream at the moment. So that is why government is also moving into drafting a watershed upland conservation policy to try and limit the detrimental impacts. I think most of the challenges we face in terms of catchment management it's in the Apia Catchment area, because this is where the bulk of the population is and most of the lands are communal and privately owned and developed and the area is still developing. [P1-MNRE]

Most participants agreed that whether it is freehold or communal land, the land ownership aspect is the major challenge that continuously defies the implementation of catchment management.

5.4.2 Monetary cost

This theme arose when discussing community engagement across Apia Catchment. MNRE respondents felt that engaging communities across a large geographical area has been costly and difficult. According to one government official, "we invited community members to a venue in the city because if held at the villages it is very expensive, we [WRD] have to take money for the ava [kava] ceremony, food and some gifts for the villagers, but if we invite them as well, sometimes community members will only attend the community consultations if lunch and sitting allowance (WST$20) per person is provided" [P2]. Another respondent mentioned, also, "when conducting community consultation, the village mayor or women representatives would only bring/invite their family members to these consultations with the ministry so they can get the allowances for themselves and their family members" [P1].

> *Catchment scale is costly. When you think about when the government wants to conserve upper ridges of the catchments area. They will have to buy those land area from the communities. Sometimes the compensations, in order to have access to those areas are very expensive and sometimes communities demanded money, but you know that is how our culture is we have to give some money when we go and consult the village...* [P6-EPC]

Overall, most participants felt that cultural obligations have been another issue that has contributed to the challenges of implementing catchment management. This makes coordination of community participation and protecting upper ridges of Apia Catchment very difficult and expensive.

5.4.3 Community resistance

Aligned with the land ownership barrier are people's attitudes towards water. All respondents mentioned community attitudes towards water. The notion that "water is a free resource from God" and therefore should be freely available is common [P2-MNRE, P7-IWSA, P8-MWCSD]. It is widely accepted that whatever natural resources are on their land, they are claimed as the land owner's property. Some participants maintained that this is because people do not understand the natural resources law and government ministries should attend to those issues.

> *You know when water charging [meters] was introduced, the communities weren't happy because they claim it's their water, because the water sources are within their [local community] land. Issues like that, there's always that clash.* [P4- MAF]

MNRE officials stated that several incidents have occurred during their work with village such as families uprooting trees, vandalising of rain gauges and hydro-loggers equipment and locals claiming money for land areas where hydro-equipment is situated [P1, P2].These incidents have prevented government officials from carrying out their replanting activities and monitoring of water resources.

After installation of rain gauge and hydro logger in one of the sites families start coming in the Ministry to claim money and stated these are government properties and they are entitled to get money in terms of land lease. If we move inland and start building road for easier access to the hydro site, people will also move inland because we have built roads now. [P2-MNRE]

We consulted the pastor and asked to use the church youth group to help out but sadly, the next thing you know we come in to visit the replanted area; it has been uprooted by the household level (families). So then I told the boys (Watershed Section) we should leave that area and concentrate on another area that needs our service more and are willing to collaborate... [P1-MNRE]

One participant raised the point that "sometimes when we [WRD] go to the villages to do consultations they [local villages] said it's your government. But I always tell them, it's not just us working for the government it's our government, meaning everybody is part of the government!" [P2]. While government officials acknowledged these community incidents, some stated that there are some villages that have shown support and cooperation. For instance one stated:

We have not done much work there due to the some issues such as land and community willingness. For some areas it is going well in there and the villages are well versed of these issues. And now we are also working with some villages with regarding the take of critical land areas in the upland and they are very supportive. But it is not working well in some sub-catchments… [P1-MNRE]

Overall, it can be seen that although the MNRE has sought help from trusted community-based organisations in the hope of engaging more with the communities, there is mistrust between the government and the local people which reflects how they interact differently with the catchment approach. For example while there is some support in some villages through collaboration with government officials there are still others that contest these catchment initiatives by vandalism, which is clearly perplexing for government officials.

5.4.4   Issues outside catchment areas and boundaries

When discussing the establishment of Catchment Committee roles, there is wide support amongst the participants. However, some participants stated that there are issues such as climate change, natural disasters, water quality and land ownership occurring outside of catchment areas that are important but cannot be managed or governed within these catchment boundaries or using these catchment-based committees [P1-MNRE, P3-MNRE, P4-MAF, and P7-IWSA].All participants felt that this is an important aspect that MNRE had to consider and should take into account when setting up these committees and implementing catchment management.

I also think there are limitations with catchment approach for example it cannot solve issues such as water pollution and land ownership. We all know different families own different part of that land with Apia Catchment [P5- SWA]

It is true there are issues that we have no control of. For example cyclone Evan in 2012, it causes major disruption to the whole water supply of Upolu; there was no electricity no water for weeks. [P1-MNRE]

Another issue outside of these catchment areas according to one government official is that while money was available, the implementation was smooth. But once the project term (IWRM Demonstration Project) was finished there was no longer any ability to pay for community involvement, and the ability to continue implementing catchment management activities were diminished.

> *Apia Catchment was an IWRM project site the project financed many community engagement programs and consultations. For example when we have community consultation people were paid $20ST per person to attend seminars and consultations. And after the project, there was no money and there was no more commitment from the communities.* [P2-MNRE]

Overall, there are issues outside of catchment areas that need to be taken into account by government officials when implementing catchment management.

5.5 Summary

This first part of the results has presented the analysis of semi-structured interviews with government officials and NGO staff. It has been organised around the prominent themes that arose and were discussed by participants to help understand how catchment management is implemented. The results revealed how the government sees the catchment approach embodying ridge to reef management generally making water management and governance easier compared to other levels such as national and village level. The government's idea of promoting local ownership through setting up Catchment Committees as 'helping hands' signifies its grand plan for the devolution of authority to the local villages. In the midst of these ideal perspectives, several challenges such as land ownership, financial institutions' guidelines, community resistance, and issues outside of catchment boundaries were also highlighted and discussed.

Chapter 6 – Community Perceptions

6.1 Introduction

This chapter outlines community perspectives expressed in focus groups held in the two villages of Apia Catchment, namely Vailima (V1) within Vaisigano sub-catchment and Tapatapao (V2) within Fuluasou sub-catchment. It highlights the differences and similarities expressed by each target group on catchment management. There was acknowledgement of the importance of water and the benefiting opportunity of catchment management across the target groups. However, some target groups did not agree with this benefiting opportunity while others did not explicitly state any benefits at all. While the majority of the target groups from both villages saw the opportunity of catchment management in bringing everyone involved together, they also highlighted concerns on this scale of management.

6.2 Opportunity and concerns for catchment management

6.2.1 Bringing people together

When discussing the benefits of having one catchment by-law (refer section 2.3.5) and the creation of Catchment Committees several target groups felt that catchment management is useful and suitable as it can bring people together. This is because there are different villages within each sub-catchment; so, selecting members from each village to be present at Catchment Committees will be a good start to initiate catchment management programmes. Also some target groups perceived that one watershed management plan and by-laws can avoid conflict between villages [V2-Chiefs].

> *I think with the catchment scale management it can bring together the different villages. That is one management plan makes people think as one. But if we have different village by-law for each individual village it will be war and disaster! People will fight and there will never be working together, because different by-laws or plans for each village can create tensions. But this catchment scale management can generate the feeling on ownership in us and them if they don't have it.* [V2- Chiefs]

> *The management plans and by-laws that the government is enforcing using this catchment approach I think that is not bad. I don't think there is or can be an issue if village work together. I think the government and village can work together…* [V1- Women]

However, while high chiefs and women's groups of both villages see potential opportunity in the catchment approach, participants in the untitled men's groups of both villages thought otherwise. They stated that it is very difficult to bring everyone together especially when there are different villages within a catchment having different governance systems (refer section 2.2.3).

I think it is hard to know because there are different villages within one catchment, and we can never find one whole solution into something. There will never be one heart one community working together to collect and conserve water for the whole country, because there are different villages. And that will depend on the village councils of each village as well. [V1- Untitled Men]

Women and high chiefs' groups of both villages tended to see more of the opportunity of the catchment management approach than the untitled men's groups of both villages who referenced the traditional systems such as village councils who make the decisions for the villages.

6.2.2 Interpretation of the term boundary

Concerns about the word 'boundary' arose when catchment maps were discussed together with management activities that government ministries have implemented. Boundary is translated in the Samoan language as 'tuaoi'. The word is very sensitive and complicated when land issues are involved or affected. Of all the target groups, the high chiefs' of both villages were the first to point out the word boundary and perceived catchment boundaries as a threat to the traditional social systems especially in terms of land. According to some chiefs when a boundary is imposed on people it means they have to act in a certain way that is expected of them and that should not be the case to manage water. Several respondents felt and perceived that because of these catchment boundaries conflicts such as tensions between the upstream and downstream communities regarding deforestation or contamination of water quality due to human activities, between villages can or may arise. Indeed, it was stated in one focus group that people would 'freak out' if this word was used [V1- Chiefs].

I think this will be the only thing that will cause some conflict with regards to water resources management, especially with the work the MNRE is doing. It is because the government created boundaries, it is when boundaries are create that tensions and conflicts between people come up… but please never impose these boundaries as boundaries on people and their land. [V2-Chiefs]

Other target groups suggested using another word to describe a catchment boundary such as catchment track, line or trail to describe catchment areas.

I think this word boundaries is so painful and heavy! When you talk about boundaries, things can become very intense. I think why not use catchment track or trail or any other word other than boundaries. [V1-Untitled Men]

Although the government officials mentioned that the government is not imposing boundaries onto the communities but are used only as management tool to manage water (refer section 5.3.3). Nonetheless, the concern with the word boundary was frequently mentioned by most target groups. This was discussed far more by the high-chiefs and untitled men's groups compared to the women's target groups of both villages.

6.2.3 Land ownership

Concerns on communal land ownership were commonly raised by all target groups of both villages. However, the V1 target groups emphasised and discussed this issue more explicitly compared to V2 groups. This was noted in the V1 untitled men's group comment that:

> *The government is bringing in replanting trees of catchment areas but you know …these lands are communal land owned by the village. Who knows, maybe after the [government] plant trees, and then they will claim it…That will cause trouble and arguments. But if our own villagers manage our own land then things will improve and stay better…No issues with land…the village matais can work together with the government.* [V1- Untitled Men]

While the high chiefs and untitled men's group of Vailima (V1) as well as untitled men's group of Tapatapao (V2) showed concern of the government taking over communal land. The womens group of both villages suggested because the local communities have limited understanding of all these programmes by government that is why communities felt that way [V1-Women, V2 Women]. The high chiefs' group of Tapatapao village (V2) also support the women groups' views.

6.2.4 Accountability

The term accountability came up when discussing how the government was proposing to setup Catchment Committees and development of by-laws for each sub-catchment. Whether the groups were referring to Catchment Committees, decision making or duties and responsibilities of government ministries, the theme of accountability was raised. Focus groups suggested that the proposed implementation of catchment activities and management has not been synchronized well within local village groups [V1-Unitled Men] and some perceived that there have been too many committees [V1-Women, V2-Women]. Other respondents thought Catchment Committees will add yet another tier of authority to those that have already existed such as traditional village council and also the transparency of decisions made at the catchment level [V2-Women].

> *….We already have Water Committees, Womens Committee,…If we put up another Catchment Committee, that will be more than one committee looking after water issues…Too many committee…I believe we should just stick with the committees we have…*[V1- Women]

> *Catchment Committee! Who will select them? and how will the ministry (MNRE) make sure that the committee members are doing their job? Will they get paid? Knowing our Samoan way of doing things, it is not what we know it is who we know! It is good to set up Catchment Committee but it is hard to monitor their work, unless the ministry has a system in place...* [V2- Women]

This concept was commonly mentioned by the womens' groups of both villages. This may have been because the current water committee members for V1 are mostly high chiefs (men) and untitled men who do the repairing and maintenance for the water systems. This raised the

question on gender equality of catchment scale management; however, this aspect is beyond the scope of this study.

6.3 Recommendations to address concerns on catchment management

The community target groups also stated and suggested ways to overcome these concerns about catchment management.

6.3.1 Capacity building of community

Target groups pointed out 'awareness' as another important aspect that is needed to reduce community concerns of catchment management. It is believed that this can help the local people to understand the concept of catchment management activities and why these approaches are implemented in that way. For example the women's group of both villages suggested "the government should do more activities, for example river cleans up, radio program, water day school competitions and other stuff like that, so the community can be aware of what is happening with the catchments that catches our waters" [V1-Women &V2 -Women]. Furthermore, some target groups mentioned that there is still uncertainty of which (government ministry) is responsible for all or for what kind of water issues they are facing especially with water quality [V1-Untitled Men].

> *So we just don't know who to tell our water issues to, if it is SWA or MOH or whatever ministry... We just don't know who is responsible. And government ministries should take that into account…* [V1- Untitled Men]

Community awareness was raised by all target groups of both villages, but V1 groups discussed it more than V2 groups. This illustrates that there is still limited understanding of the communities within the Vaisigano sub-catchment with regards to catchment management and water related government ministries' roles.

6.3.2 Collaboration and participation

Collaboration and participation was brought up when discussing community involvement in water governance and management decision-making, as well as catchment scale management. From the group discussions, all target groups of both villages were hopeful for the successful implementation and adoption of catchment approach and management in Apia Catchment. For example women's group mentioned "catchment approach activities can work if villages and government can just work together" [V2-Women]. Other target groups suggested ways to enhance collaboration between villages and government ministries. For example they stated:

If the government don't have enough human resources or money then we (refer to high chiefs and village mayors) can give you (government) some advice…if not enough human resources then use us (pulenuu) the village mayors and (sui o le tina) womens representative. But provide us with some allowance or some small payment! Because these people have knowledge of the villages and places the government doesn't know about it [V2- Chiefs]

We want some benefits, as well, in terms of money for our village youth groups and families because we can do the replanting and maintenance of trees and protection of the river, but MNRE have to give up some compensation for that. [V2- Untitled Men]

Interestingly, one respondent from Vailima untitled men's group thought otherwise about collaboration between government and villages, and stated that the government should just leave the management of water resource to the village council.

…if the government wants communities support they can just leave it to the village councils to [soalaupule] *talk it over the issues of water management, maybe we*[villagers] *can make much better decisions than them* [government]. *But the government won't let us manage the water sources. And the government always points out it is them that owns the water sources…* [V1- Untitled Men]

All in all, the majority of target groups of both villages support catchment management implementation but emphasise the importance of the government to recognize community involvement through some financial compensation.

6.3.3   Increased enforcement

Increased enforcement was raised and discussed mostly by the target groups of Tapatapao village. Most target groups felt that is very important for the government to enforce water laws and policies because "water is for everyone" not just for one family or one village [V2-Chiefs]. The women's group of Tapatapao also emphasised it is a 'must' for the government to make sure that catchment areas are protected and conserved.

I feel that MNRE is weak in terms of strengthen and enforcing the law. I know that under the water Act, wherever there is water sources and whatever water source for example spring, river, stream, groundwater, coastal spring...etc. The public has to know that, that is government owned. I suggest MNRE and government should and must use the legislation and policies to strengthen enforcement. [V2- Women]

So what I suggest is to use the law and Act, legislation that we have to do our activities even managing at the catchment scale, because water is for everyone. Water is not just for one family or individual it is for everyone. And the Water Acts and legislations were meant for all Samoans as well. [V2- Chiefs]

Vailima target groups only raised this aspect but did not discuss it in-depth compared to Tapatapao. Nevertheless, this shows the difference in how community perceived catchment management, i.e. while some shown support others do not.

6.4 Summary

This chapter has presented the analysis of the focus group discussions with community target groups in two Apia Catchment villages. The results highlighted community perspectives and indicates that communities have mixed views of catchment management. Firstly, some target groups see catchment management as an opportunity to bring everyone together. However, other target groups (untitled men's groups) of both villages argue against this view. Concerns were raised about the use of the term boundary and about accountability of decision made at this level and the impact of this approach on land ownership. While target groups raised concerns they also pointed out some recommendations towards catchment management such as community awareness, collaboration between government and villages and increased government enforcement.

Chapter 7 – Discussion

7.1 Introduction

This study has investigated the implementation of catchment management in Samoa by examining government and community perceptions of how a catchment-based approach has been implemented in Apia Catchment. This research uses the concept of scale to interpret how catchment management has been adopted and how communities perceive this level of water resources management and governance. Chapter 5 presented the key themes that emerged from the document review and interviews with government representatives. Chapter 6 presented the key themes from community focus groups. This chapter links the findings in Chapters 5 and 6 to the conceptual framework outlined in Chapter 3. It begins by exploring the implementation of catchment management in Samoa's Apia Catchment. This is followed by exploring community perceptions, the challenges and implications of such an approach, examined through the lens of scale and in the light of the challenges of catchment governance identified by Cohen and Davidson (2011) and other authors: boundary choice, participation, accountability, policy-shed and problem-shed.

7.2 Catchment management implementation

A decade ago the Government of Samoa (GoS) undertook major reforms across the Water and Sanitation Sector. This can be seen by the change and shift of the institutions i.e. recent set-up of Water Resources Division (WRD) in 2006, followed by the transfer of the Watershed Section which was previously under the Ministry of Agriculture and Fisheries (MAF) which is now under WRD housed within the Ministry of Natural Resources and Environment (MNRE). At the time, most of the catchment activities were agricultural and forestry oriented (see section 5.2). This was when local communities were encouraged to plant timber trees for merchant use, as commercial logging was the major source of government revenue at the time. As such, respondents from MNRE stated that "catchment management is not a new approach — it has been seen and used in Samoa, but it is only its implementation that has changed" [P2, P3].

Following the institutional reform, the WRM Act came into force in 2008. Part VIII of the Act mandates the protection of catchment areas and Part IX requires the development of by-laws. This was followed by the choice of the GoS in 2009, to use the Apia Catchment as an IWRM national demonstration pilot project to support the mainstreaming of IWRM into water resources management and governance framework. Initiated by this project, the implementation of catchment management has become institutionalised in Samoa. At the same time, the WRD created newly updated catchment boundaries (Figure 5-2) and so, Samoa was further sub-divided, from 28 to 65 catchment areas. This was supported with the development of Watershed

Management Plans (WMPs) for each sub-catchment. These WMPs were to be complemented by catchment by-laws which promoted community engagement of villages in catchment programmes and activities. During the IWRM Demonstration Project, four WMPs for each sub-catchment of Apia Catchment have been developed while Catchment Committees and catchment by-laws are still in the process. As such, it also assists with identifying or demarcating management areas for legislation and management purposes (Blomquist & Schlager, 2005).

Currently, the putting into practice of catchment management i.e. the adoption and application of catchment boundaries and using of catchment as a spatial unit for water governance and management is generally the core function of the current Water Resources Division (WRD). Some examples of catchment management implementation include the government effort in purchasing communal and freehold land that is considered critical in the upper ridges of Apia Catchment, the use of village-based society groups such as churches for the implementation of these replanting initiatives along with improved planning and allocation of resources from overseas aid. These catchment management activities reflect key principles of the IWRM framework (refer section 2.3.4) i.e. "water development and management should be based on a participatory approach, involving users at all levels" (GWP, 2000, p. 14).

The general understanding across all government ministries (P1, P2, P3, P4, P8), state-owned enterprises (P5, P6) and NGOs (P7) interviewed is that the catchment approach embodies the management of water from ridge to reef i.e. everything within catchment boundaries are interconnected. For that reason, most of the respondents favoured management and governance at the catchment scale, due to the naturalness of the boundaries of the catchment as a unit and interconnectedness of various ecosystems (land, water, forest and sea) within catchments. These findings resonate with the views of Davidson & de Loë (2014); Molle (2009); Pereira (1989) and Warner et al., (2008) i.e. managing and governing at a hydrologically defined scale holds a certain appeal because of the apparent naturalness of its morphological boundaries. These perceptions on the implementation of catchment management capture and relate to the formal definition of IWRM as a "process which promotes the coordinated management of water, land and related resources in order to maximise social welfare" (GWP, 2000, p. 22).

Furthermore, these general understandings amongst the interviewees reflect how integral the IWRM framework and catchment management is at the national level amongst the water-related agencies. While this shows there is a common understanding of catchment management amongst all water-related agencies, this study reveals it is mainly the Ministry of Natural Resources and Environment (MNRE) that advocates and implement catchment management. This is understandable because catchment management implementation is under its mandated

roles and responsibilities. MNRE participants felt positive about the implementation of catchment management through the IWRM framework and commented that since the adoption and implementation of catchment scale management there has been a great improvement in the management of water resources, for example improvements in the coordination and integration of all agencies involved in water projects under the Water and Sanitation Sector at the national level. Therefore, catchment management is perceived by the government as integrative, participatory and useful.

Notwithstanding the expectations and perceptions expressed by government officials, especially MNRE participants. Many other scholars are still debating the exact meaning of IWRM in terms of its potential to achieve explicit outcomes in water resource management (Mollinga, 2008; Saravanan et al., 2009). For example Biswas (2004, 2008) argues that IWRM implies the concentration of all water related-tasks and responsibilities towards or under one sector i.e. the water sector. He emphasises that this would not be practical because of the difference in terms of service charters and polices in other organisations, agencies and sectors such as the agriculture and energy sector. This was evident in the case of Samoa, as discussed in section 5.3.3, where MNRE officials see this scale of management in bringing all water users together under one sector. However, this expectation contradicts with other government ministries' and NGOs' perceptions of catchment management as not being their concern. It would appear that this leaves MNRE as the only major advocator of IWRM and catchment management. In addition, arguably, it would make other water related agencies less integrated to participate in the Water and Sanitation Sector programmes.

At the local or village level, several village groups i.e. the high chiefs and women's groups from both villages brought attention to the potential opportunity of catchment management in bringing people to work together to protect and conserve catchment areas and water resources. Also, when discussing the development of catchment by-laws (see section 2.3.5) and the establishment of Catchment Committees for each of the four sub-catchments of Apia Catchment, they claimed that because there are different villages within each sub-catchment, selecting members from each village to be present at Catchment Committees and assist in the development of by-laws would be a good start to initiate catchment management programmes. These are consistent with the findings in Leendertse, Mitchell, & Harlin (2008) who stress that applying the IWRM based approach can bring together communities, water managers and opinion leaders (teachers, religious leaders, media reporters) in a common cause to achieve sustainability by conserving both water and ecosystems.

However, while high chiefs' and women's groups of both villages see a potential opportunity in the adoption of catchment management in bringing people together, the untitled men's groups of both villages thought otherwise. They maintained that it is very difficult to bring everyone together especially when there are different villages within sub-catchment areas having different traditional governance systems. This perception reiterate the claim of Kerr (2007) and Swallow et al. (2002) that catchments are useful hydrological units but are not natural units of human social systems; along with Blomquist and Schlager,(2005); Biswas (2008); Mollinga (2008); O'Neill (2005) and Saravanan et al., (2009) claim that this new scale for planning, managing and decision making embedded within the IWRM can present several challenges if it is imposed over pre-existing scales of decision making such as the nation, districts and communities. It can push aside or invalidate existing cohesive social and cultural practices. For example, in the case of Samoa, at the village level, the village council (fono ale nuu) made up of high chiefs, is the main decision-making body for the villages. Its role is to manage, monitor and ensure the safety of the villagers and make certain the village's rules are followed. Founded on these traditional structures each village has its own traditional salutations (fa'alupega) based on the traditional order of title primacy in each village.

This is evident in Apia Catchment's case where there are traditional villages with their own traditional structures i.e. village councils which make the decisions for the villages' land use because most of the land is communally owned. In Samoan traditions particularly with land, the de facto ownership of village communal land is acquired and claimed by whoever first clears a forest area for plantation. These clearances are mainly done by the untitled men as part of their service to their family (tautua), respect (fa'aaloalo) and following the orders of the village chiefs or family chiefs. This traditional rule has been passed down from generation to generation. These pre-existing cultural practices are valuable to the communities of both villages that participated in this research and they are being seen as threatened by catchment management implementation. This example maintains Horlemann and Dombrowsky (2011) concern of IWRM as encouraging the challenges which have resulted in the "problems of fit and interplay across scales and levels" (p. 1548).

These situations and perceptions reflect part of the mismatch scenario (see sections 3.2.3 – Figure 3-5 [b]) when the upper-level managers [national government agencies- (B-Blue Box)] have nothing to do with or do not relate to the same ecological process level i.e. catchment- (B-Green Box)], while the lower-level managers [village councils and local people] are confronted with ecological problems [climate change, natural disasters and water quality – refer section 5.4.4], that they lack the resources to deal with (C-B mismatch).
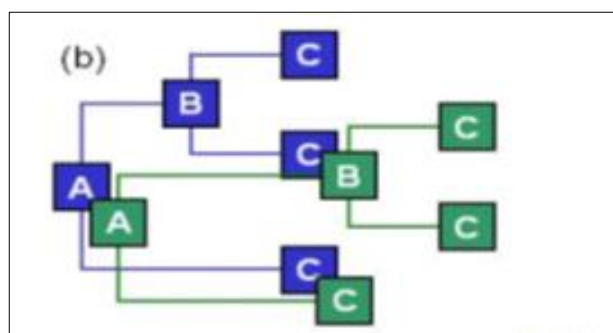
There are three levels A, B, C. The overlapping boxes represent the interactions between these levels. Green boxes represent the ecological processes and blue boxes represent people managing these ecosystems.

From this case it would appear that catchment management is certainly understood by means of it as a hydrological system and the notion of catchments as a whole integrated unit. This is a shared view amongst all government representatives, SOEs and NGO interviewed especially the MNRE officials. However, the laudable focus of Samoan government officials has been on implementable actions on the ground, for example, the rehabilitation of degraded land in the upper ridges of the catchment and the zoning of critical areas and purchase of land by government. But what this is overlooking is the need for the setting up of regulatory and organisational structures integrating local systems that fit the villages because at the village level, there different villages with different governance systems (village councils). This study has shown the need for government officials to critically examine this scale of management and its implications before implementation. As Cumming et al. (2006) illustrates in Figure 3-5 [a], the ecological processes need to be managed by people who have the mandate and the power to act at the same level as the ecological process. This might yet be possible for Apia Catchment's case.

7.3   Challenges of catchment management

Samoa is a small developing country that faces many challenges like many other small island nations. The results of this study reveal several challenges for the implementation of catchment management in Samoa; namely, land ownership, monetary cost, community resistance and issues outside of catchment areas and boundaries. This section discusses these challenges and is organised around the prevalence of five distinct challenges of catchment scale governance highlighted by Cohen and Davidson (2011) that include boundary choice, accountability, public participation, policy-shed and problem-shed. Evidence and examples from Apia Catchment illustrate these catchment management challenges and are discussed below.

7.3.1 Boundary choice

In Samoa, boundary choice has changed. Figure 5-1 shows the whole drainage area is called Apia Catchment, but overtime the boundary has been altered and now Apia Catchment has been divided into four sub-catchments (Figure 5-2). According to MNRE official, the newly updated catchment boundaries (Figure 5-2) were drawn and compiled into a GIS mapping layer by a volunteer engineer from Australia, when he was working with the Water Resources Division during his mission between 2006 and 2010. The legitimacy and validity of these catchment boundaries and names have yet to be confirmed by MNRE. An MNRE respondent noted that the "current catchment layers and boundaries have not been legally defined and verified" [P1]. However, the WRM Act (Part VIII) requires the protection of watershed areas and outlines the purpose of Watershed Management Plans. Despite those requirements there is no legislative definition of 'boundary' within the WRM Act, only 'watershed areas'. Although the boundaries are not legally defined, MNRE senior staff clarified with a statement, "we [refer to WRD] are just using catchment boundaries as a management tool to manage water" [P1]. However, Blomquist and Schlager (2005) state that choosing which "watershed boundary to use is often as much a political act and choice as it is a scientific one based on the hydrologic flow of water" (p. 105). Warner et al. (2008) reiterate this point and add "as soon as the matter of choice is present, then there is a role for politics which, among other things, is about who decides and how and with what effect" (p. 12). In this way ostensibly natural catchment boundaries can become political boundaries. This was evident in the case of Apia Catchment where the current catchment boundaries are not only unofficial but also changeable.

The government participants stated that several reasons were considered when establishing boundaries for Apia's sub-catchments and the development of WMPs and by-laws. These include: i) the natural hydrologic flow of waterways embodied within the concept of ridge to reef; ii) the allocation of government resources towards prioritized catchments, for example, the boundaries of the two sub-catchments, i.e. Fuluasou and Vaisigano were influenced by their roles in supplying water and as a source for hydroelectricity to most of the urban areas; iii) intent to get all the water users across the catchment area to be involved in water management programmes including the IWRM demonstration project. One participant commented that "the adoption of catchment approach has permitted and enabled all water-related users to come together under one [Water] sector and has resulted in a lot more integrated approach of different agencies within Apia Catchment" [P3]; iv) financial directives of overseas organisations i.e. catchment management is a condition of funding and aid from institutions such as Global Environment Facility (GEF) and European Union (EU); and v) the adoption of catchment management has involved the creation of proposed Catchment Committee for each sub-

catchment that will assist the Water Resource Divison (WRD) with the enforcement of catchment by-laws and WMPs for each sub-catchment. Indicating further the flexibility of the boundaries, the interview with MNRE staff indicated "these layers [catchment boundaries] will surely change again in the future when more advanced information and technology is available" [P2].

Despite these reasons and perceptions, the villages have shown concerned with these catchment boundaries. In Samoa, the word 'boundary' is very sensitive and complicated especially when land is involved or affected. This was reiterated by the high chiefs of both villages when they commented that when the word 'boundary' is used it means people have to act in a certain way that is expected of them and some people would 'freak out' if this word was used. Several respondents in target groups felt that because of these catchment boundaries conflicts such as tensions between the upstream and downstream villages regarding deforestation or contamination of water quality due to human activities can or may arise. The concerns with the word 'boundary' and land ownership were frequently mentioned and discussed far more by the high-chiefs' and untitled men's groups compared to the women's target groups of both villages. Even though the women's target groups supported the concerns, the men seemed more worried about the future implementation of catchment management, especially with land ownership. This shows the cultural status of men being the head of the household and the decision makers as well as their duties to work the land in Samoa's traditional families (aiga). Interestingly, some respondents suggested using another word to describe a catchment boundary such as catchment track, line or trail to describe catchment areas. These highlight how the catchment is not just a simple spatial unit but a very complex one. It is influenced not only by social, political and economic factors but also organisational and administrative demands.

Similarly, the issue of boundary choice relates to the complex nature of watershed boundary descriptions and definitions. The common definition of a watershed as an "area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course" (USEPA, 2012,"Watershed",para. 2) gives the impression that a catchment is physically clear and hydrologically based. However it does not offer any guidance on which watershed boundary is most useful for the purpose of management (Cohen & Davidson, 2011). Should it be a big watershed or small watershed? In the case of Apia the delineation of catchment areas has changed from big to small sub-catchments and all WRD's implementable actions, as stated before, and governance instruments for water are based on these current divisions. A respondent also highlighted that groundwater resource boundaries do not align with surface water flow. This reiterates the notion of Del Moral & Do Ó (2014) and Moss, (2012), although a river basin or catchment boundary may be well-defined on the surface (related to surface water flow), this does not account or may not be the same for groundwater

resources. Therefore, the hydrological boundary used by MNRE to define the scope of catchment management policies, WMPs, Catchment Committees and catchment by-laws is contingent of governance and management needs and are flexible.

7.3.2 Participation and empowerment

The whole of Apia Catchment consists of approximately 83 villages (Samoa Bureau of Statistics, 2011) this number creates an enormous challenge for orchestrating participation and empowerment. According to MNRE respondent, because of the diversity of the different villages involved, engaging communities in Apia Catchment has been very expensive and difficult. This challenge of participation and empowerment relates to the decentralisation of authority to the village level, for example, through the establishment of Catchment Committees.

MNRE has proposed Catchment Committees at the catchment level to assist the Ministry for the purpose of easier enforcement of catchment by-laws and WMPs for each sub-catchment. These Catchment Committees are yet to be established and approved by Cabinet but they are similar to RBOs discussed by Horlemann and Dombrowsky (2011) who maintain that the adoption and uptake of catchment scale management typically involves setting up such entities. This revolves around the apparent principle of the IWRM framework that there is a need for a spatially integrated body that can coordinate water transactions amongst users or between communities and the government. Moreover, it represents the devolution of decision making from national government to the local villages highlighting the principle of subsidiarity i.e. decentralizing decision making to the lowest appropriate level (GWP, 2000, pp. 13-14). Advocators of IWRM believe that local level management can improve the integration of water resource management (Manyanhaire & Nyaruwata, 2014). This was seen in the case of Apia Catchment where MNRE through financial support of the IWRM demonstration project developed four individual watershed management plans (WMPs) and proposed the establishment of a Catchment Committee and catchment by-laws for each sub-catchment. According to government officials, these WMPs and by-laws are to be community driven, to further promote participation and empowerment amongst individual villages within each catchment. The water resources managers perceived that the establishment of Catchment Committees will be a useful mechanism to promote local ownership of water resources management activities i.e. linking more with the communities. For example as discussed in section 5.3.4, one interviewee claimed "we [the government] want them [the communities] to take responsibility for the management of the water sources within their villages". This reflects the government's thoughts and expectations of catchment management; i.e. it would enhance community involvement and local people would be more engaged in the management of water resources within their villages.

However, while the implementation of catchment management through the setting up of Catchment Committees and collectively by-laws may seem acceptable in the eyes of MNRE in order to increase community participation, Brown and Purcell (2005) argue for the need to be aware of the 'local trap' in which organisation, policies, and action at the local scale are thought to generate more desired results than activities organised at other scales and levels. This may also be applied to all other levels and scales i.e. no specific level or scale can essentially be more appropriate than others in order to achieve sustainability in resources and the accomplishing of policy outcomes. Davidson and de Loë (2014); Warner et al., (2008) and Warner et al., (2014) discuss that moving towards sustainable river catchments requires much more emphasis on developing collaborative relationships for water governance and management that are built on existing organisations and administrative structures rather than focusing on the establishment of these unitary RBOs. The concern of these authors is that the focus on the establishment of RBOs and the creation of water policies that are based on catchments can compromise current policies or involve new institutions and responsibilities that can cut across existing customary practices and institutional arrangements to the detriment of water governance and management.

In the case of Apia Catchment, Catchment Committees have been planned and are yet to be set up. Therefore it is important for MNRE to take into consideration these stated concerns. Although MNRE has the authority through the WRM Act to implement WMPs for Apia Catchment, local villages have demonstrated that they have the ability to influence decision making at the catchment level. This can be seen through 'community resistance' (see section 5.4.3) as the communities declared the ownership of land and water resources and contest these catchment initiatives by vandalism and the uprooting of trees. Furthermore, there is a common perception by local people that water is a gift given from God and should be free, which is clearly perplexing for government officials.

From a multi-level governance and management view, the interaction between levels of the same scale is important but also involves challenges. For example, the lack of coordination and collaboration between levels of administrative scale occurs when the local level communities are inaccessible and unaware of the decisions in the top level management and the top level management does not encourage local community participation or is out of touch with communities (Lovell et al., 2003).These challenges increase our understanding of the 'problems of scale', specifically on catchment scale and open important questions about how catchment management is implemented. They also reflect local villages' interactions with catchment management. Therefore, deeper consideration by the government is needed on how these WMPs, catchment by-laws and Catchment Committees will function, how members' representation will work and how their duties and responsibilities will be changed and decided. These should be clear to both villages and government officials.

7.3.3 Accountability

Cohen and Davidson (2011) highlight the accountability challenge: it "can be seen as a function of the process through and the degree to which participants and agencies are involved in the decision making process" (p. 3). In Samoa, many changes and institutional reform in water governance frameworks (see section 2.3.5) have happened at the national level. For example, the first National Water Resources Strategy (NWRS) 2007-2017 was published in 2007. This was developed to support the putting into practice of the WRM Act through the combined efforts of all government ministries, state-owned enterprises (SOE) and NGOs, who were consulted during the development process of this document. Furthermore, the NWRS presents the tools with which to plan, conserve, develop and manage water resources as well as ensuring collaboration between different stakeholders so as to achieve the national goal and objectives of the government (MNRE, 2007a). This shows accountability of decision making at the national level amongst Water and Sanitation Sector agencies.

In catchment management, Cohen and Davidson (2011) discuss the accountability of decisions made at the catchment scale is a challenge especially when catchment boundaries are not aligned with electoral administrative boundaries. For example Sneddon (2002) discusses the tensions in the management of Nam Phong basin in Thailand, where the local communities argue that the government representatives who were involve in the management of the basin respond and relate only to their jurisdictionally defined constituency rather than the catchment level. This is similar to Samoa's case where catchment boundaries do not match with administrative district boundaries (refer Figure 4-1). However, in Samoa there is no district administrative government only the national government (see section 2.2.3) and the administrative boundaries are only used for electoral voting.

In the case of Apia Catchment it is important to note that the creation and implementation of WMPs, development of catchment by-laws and the proposed establishment of Catchment Committees can be seen as an act of accountability by government. However, the local communities thought otherwise (refer to Section 6.2.4). When discussed how the government was proposing to setup Catchment Committees and the development of catchment by-laws for each sub-catchment they spoke of the accountability of these approaches and stated the implementation of catchment management activities has not been synchronized well within local village groups [V1-Unitled Men]. For example, they were sceptical about the government catchment management initiatives such as replanting of and rehabilitation of the upper ridges of the catchment areas, claiming these activities are politically driven, meaning they perceive that the government is going to take their land. While the women's group of both villages perceived that there had been too many committees; some thought that Catchment Committees would add yet another tier of authority to those that already exist, such as the traditional village council

(fono a le nuu) [V1-Women and V2-Women]. Other respondents were concerned about the accountability and transparency of decisions made at the catchment level [V2-Women] (see section 6.2.4). So it appears that these concerns were commonly mentioned by the women's groups of both villages, since the current water committee members are mostly high chiefs and untitled men who do the repairing and maintenance for villages' water systems. This raised the question about gender equality of catchment management; however, this aspect is beyond the scope of this study.

Overall, it would appear that the degree of accountability of catchment scale management in Samoa has been one sided .i.e. the government side. In Apia Catchment, this is still questionable and village communities hold uncertainties about decision making at this level.

7.3.4 Policy-sheds

No single policy or set of policies can entirely include the catchment area as most of the policies developed are at different levels. According to Cohen (2012) and Cohen and Davidson (2011) this often leads to overlapping legislation and policies resulting from irregularities between watershed boundaries and administrative boundaries and scales. As stated, Samoa does not have a district government system. This means all national matters ranging from water supply, electricity, land, planning and infrastructure to villages and individual matters are managed by national level agencies (UN-Habitat & UNEP, 2014). In the Apia Catchment, land use planning, development and conservation involves many other pieces of legislation; for example, in the downstream areas within the urban district boundary, the land uses are directed under the Planning and Urban Management Act 2004. While in the upstream areas the conservation of upland areas and forest is directed by the Forestry Policy 2007 and the catchment management activities are separately directed by WRM Act, WMPs and catchment by-laws. As a result, the policy-shed is a mix up of overlapping and competing legislation which do not match up with the catchment boundaries, reiterating the claims of Schlager and Blomquist (2000) that "administrative boundaries are usually multiple and overlapping" (p. 16).

In the case of Apia Catchment there are many water users such as EPC, SWA and local people. The presence of these multiple water users (EPC, SWA and traditional communities) in the catchment creates a complex, multiple-level and cross-scale setting that has the potential to introduce issues of scale mismatches leading to the challenge of the policy-shed. Therefore, people try to deal with a mass of difficulties and situations that vary in scale and level. For example, in Apia Catchment most of the water users do not have mandates that are determined by the catchment management or catchment boundaries. Illustrating this, an interviewee responded, "we have a very huge interest in catchment base approach, but unfortunately it is not in our mandates, or corporate plans and policies" [P5-SWA].

Overall, this challenge highlights the need for MNRE to specifically identify and clarify the relationships and interactions of the catchment management policies, by-laws, WMPs and activities to other legislations and water-related agencies mandates within Apia catchment.

7.3.5 Problem-sheds

The problem-shed concept refers to issues or problems outside of catchment boundaries such as climate change, invasive species and the impacts of human activities (diffuse nutrients and sediment losses from land use change and the discharge of agriculture and industry pollution) (Davidson & de Loë, 2014). This is similar to the policysheds where there is disparity between the catchment boundaries and the spatial extent of the issues. For example, according to the State of the Environment Report (2013), Samoa is considered to be highly vulnerable to climate change conditions and extreme events such as cyclones. In 2012, Cyclone Evan struck the islands impacting the whole country but the most devastated area was Apia Catchment by severe lowland flooding. These natural events were reiterated by some participants, stating these issues (refer section 5.4.4) occurring outside of the catchment areas are important but cannot be managed within these catchment boundaries or using catchment-based committees. These perceptions maintain Kerr (2007) claims that there are hydrological linkages among different parts of catchment areas and issues outside of catchment boundaries that cannot be visible within this scale. Most participants felt that this is an important aspect that MNRE had to consider and should take into account when setting up Catchment Committees and implementation of catchment management. These challenges illustrate that catchment boundary cannot capture the range of problems and opportunities in a catchment and they highlight the limitations of uncritically accepting the catchment and its boundaries as the natural governance or management unit for water.

7.4 Summary

This chapter has examined some of the challenges and perspectives discussed by government officials arising from implementing catchment management in Samoa. It also addressed how communities of Apia Catchment perceive this level of management and governance. It has been found that although it seems applicable and appropriate to manage Apia Catchment and, more broadly, Samoa's water resources using the catchment level, there are challenges. These were expressed by government officials i.e. catchment scale is very complicated especially when locals and land issues are involved, some issues may need to be addressed and solved beyond catchments for example climate variability, water quality and land ownership. Other participants outside of MNRE proclaimed it is not their job to know about the catchment level and approach because it is not in their organisation's corporate services plan to implement it or under their mandates. Therefore, presently there are serious obstacles and complexity of issues for governmental responsibility for catchment management.

For local communities in this study, their perspectives towards catchment management are mixed while some see an opportunity others do not. However, based on the overall focus groups' perspectives, the local villages show more concern perceptions on catchment management implementation than benefits. Therefore, it would appear that the benefit and sustainability of water resources management is not always clear for villages and government. This research has shown there is a gap between the implementation of catchment management as prescribed by government officials and overseas partners and community views.

Chapter 8 – Conclusions

8.1   Introduction

To recap, in Chapter 2 a background context of the island was outlined with an overview of Samoa's water resources challenges, uses, and management and governance frameworks. Chapter 3 outlined the conceptual framework in which the concept of scale is used as the lens to help explore the deployment of the catchment approach in water resources management and governance in Samoa. Research methods were outlined in Chapter 4. Chapters 5 and 6 presented the results collected from semi-structured interviews with government officials and community focus groups in two villages of Apia Catchment. In Chapter 7 the findings were discussed and knitted together with the conceptual framework. In this final chapter the research findings are summarised to answer the research questions, followed by some recommendations for water resources managers. Lastly, this chapter will present a brief discussion on opportunities for future research based the researcher's journey while engaging in this study.

8.2   Answering the research questions

1. **How have catchment boundaries and approaches been adopted and applied in water governance, planning and management in Samoa?**

Building on the themes and findings that arose from the interviews and document analysis, Samoa has gone through a major shift in the adoption of catchment management i.e. from agricultural and forestry oriented activities to water resources management catchment-based approaches. Although it is viewed as a way forward for the water resources management in Samoa, the results reveal that catchment boundaries are not only changeable but also unofficial (not legally defined). Yet, they are currently guiding implementation and the establishment of governance arrangements i.e. Catchment Committees, WMPs and catchment by-laws.

In the case of Apia Catchment, catchment boundaries were largely chosen based on natural hydrological factors. This is supported by the general understanding of government officials that catchment scale management is 'natural' and incorporates the concept of the ridge to reef approach. In that sense, the use of boundaries in Apia Catchment supports the claim from scholars and organisations who argue that the governance and management of water should be organised and integrated at this catchment scale. However, these boundaries were only roughly based on the natural hydrologic features of the island's landscape. There were other reasons that influenced them, such as the allocation of government resources and trying to get all the water users across the catchment area to be involved in water management programs including the IWRM demonstration project and also to promote local ownership amongst the villages through

establishment of Catchment Committees for each sub-catchment that will assist Water Resources Division (WRD) with the enforcement of catchment by-laws and watershed management plans (WMPs) for each sub-catchment. Furthermore, MNRE participants stated that, with overseas aid and financial support available, the catchment management is a condition of funding and aid from institutions such as Global Environment Facility (GEF) and European Union (EU). Government ministries were encouraged to follow and implement these IWRM oriented guidelines in order to secure funds. As government officials stated, it was not possible to operate at a different level given these circumstances. This illustrates how pervasive the concept has become globally as many institutions and organisations have embraced this concept and emphasise that IWRM should be carried out at the level of the basin. Embedded within aid and funding guidelines Samoa is expected to follow and adopt the concept. Therefore, as a developing country, this scale of management is being imposed from outside forces through funding and there is no choice but to adopt this appealing concept. What is challenging for Samoa is that there is limited institutional capability within government ministries to comprehensively examine the implications of this level of management on local people. It is in this respect this research seeks to make a contribution.

Government officials, specifically MNRE participants, stated that catchment boundaries are only used as a 'management tool' to help the government in managing the water resources. The presumption of using it only as a management tool is seen through implementable actions on the ground for example the rehabilitation of degraded areas with native trees, the purchase of critical areas in the upper ridges of Apia Catchment by government plus the use of community-based society groups such as churches for the implementation of these replanting initiatives. Also in the pipeline, the WRD has drafted the National Upland Watershed Conservation Policy to "promote the protection of the top ridges (600m from sea level) of watersheds to be excluded from any developments", adding on to the WMPs, catchment by-laws and Catchment Committees for each sub-catchments. To date, these catchment based policies and initiatives are still in draft form and have yet to be submitted for Cabinet approval.

Overall, the government promotes catchment management as a mere 'management tool' but with the proposed governance agendas as set out above i.e. catchment by-laws, policies and so on, it requires the villages within a sub-catchment to undertake decision-making together. These are expectations of governance go beyond management to on-ground actions to power sharing. However, these villages have different traditional governance systems based on their own cultural setting. Therefore, what is unclear is how integration is to occur at the finer-scale (village level) with traditional systems being aggregated into catchment level management. As such, this research shows that the village level may have been overlooked by policies developed by national government in which catchment management is often viewed or seen as 'one size fits

all' notion. In other words, it appears to have not fully taken account the diverse of socio-ecological realities on the ground. Nevertheless, the government is hoping to successfully adopt and implement catchment management activities together with the help of the villages, assumed they will cooperate.

2. How do communities in the Apia Catchment perceive, interact with and contest these catchment boundaries and approaches?

This study revealed a mixture of perceptions and views of people in the villages with regard to catchment scale management. Catchment management was mostly viewed by the high chiefs' and women's groups of both villages as an opportunity to bring everyone together i.e. the catchment as an organizing unit for the many villages. However untitled men's groups thought differently about using the catchment as an organizing element of water management. They emphasised that it is difficult because the different villages involved have different traditional governance systems. Based on the findings from the two villages, this study revealed that the villages are far more concerned with catchment management, than as an opportunity in managing water resources at this scale.

It was also interesting that the majority of the target groups raised concerns on the use of the word 'boundary' which is also associated with their concern on land ownership. In addition, there was concern about the accountability of decision making made at the catchment level through Catchment Committees. These concerns appeared to complement each other and revealed the strong relations of local communities with pre-existing cultural systems. These traditional hierarchical systems of villages played a role in how communities perceived, interacted and contested catchment management. The results also showed that communities do contest catchment management, through vandalism for example, removing hydro-equipment (e.g. rain gauges) and uprooting trees. These community resistance incidences not only reflect community perceptions towards catchment management but also the challenge faced by the advocators (basically MNRE) in implementing catchment management.

The findings revealed that Apia Catchment communities - more broadly, Samoans - are not fully aware of the concept of catchment management. The local villages know the importance of catchment areas through the implementable on-ground activities of government ministries i.e. replanting and so on; however, how it used as a management tool and soon to become a governance unit is not clear to the people. From the focus groups, the community has suggested and recommended ways to engage and enhance this approach. Firstly, community awareness: this was cited by all target groups of both villages as a critical aspect that is needed to reduce community concerns about catchment management. In particular, when catchment areas are used as management units for water governance and management, it is believed that

educating the communities can help the local people to understand the rationale of catchment management and which government ministry is responsible for what kind of water issues that local people are facing, especially with water quality. This aspect was discussed more by Vailima target groups compared to Tapatapao village groups. This illustrates that there is still limited understanding of catchment management in the community in the Vaisigano area, and perhaps now the government has decided on utilizing catchment-based management approaches. Therefore, a serious effort by the government (specifically MNRE) is needed to look at creating a platform and share knowledge to the villages to make the concept more apparent and clear to the people involved. This aligns with the claim of Falkenmark et al. (2004) that the possible key to IWRM oriented approaches is cooperation across these boundaries through the approach of social learning and creating opportunities for entities and stakeholders to participate and share their views and knowledge. However, if social learning and participatory approaches are to succeed they need to be undertaken with an understanding of the scales and levels that are at play.

Secondly, collaboration and participation was brought up when discussing community involvement in water governance and management decision making, as well as catchment approach and management. From the group discussions, all target groups of both villages were hopeful for the successful implementation and adoption of catchment management in Apia Catchment. They also stressed the importance of the government recognizing community involvement through some financial compensation. In addition to the prominent themes of community awareness and collaboration between villages and government, some target groups, especially Tapatapao village, brought up the need for the government to increase the enforcement of water legislation and policies by stating that water is for everyone and the government should make sure that everyone gets the required and suitable water.

Overall, the results from this study showed that there is a mix of perceptions across target groups of both villages. This reveals that catchment management is not fully understood by local people. Although they know the nature of catchment areas i.e. it catches the water, what alarms the community is the use of the term 'boundary' and the possibility of the government taking their land. This shows that water resources managers will need to recognize that although the catchment level appears to be natural and encompassing, it is not necessarily natural to local villagers who are organised at the village level with its attached social systems and cultural values. Therefore, the interaction between the two levels i.e. national and village is important. This research provides a glimpse into how different players at different levels function from village level to national level, thus emphasising how village people perceive and interact with catchment management.

3. **What are the challenges that arise from or for the current implementation of catchment management in Apia Catchment and more broadly in Samoa?**

As discussed in section 7.3 several challenges have surfaced and been discussed by participants with the current implementation of catchment management in Apia Catchment. The results show that although Samoa's water legislative frameworks and overseas aid partners are generally viewed as being supportive of catchment management approaches there are challenges with this level of management. The most prominent challenges identified were land ownership, lack of community willingness, costs in conducting community consultations and natural disasters. These are issues occurring in Apia Catchment and because there are other levels, for example, at the village level, the village council (fono ale nuu) made up of high chiefs, is the main decision-making body for the villages. Its role is to manage, monitor and ensure the safety of the villagers and make certain the village's rules are followed. The interactions between levels bring out the challenges that hinder the sustainable management of water resources. These challenges show that while catchment approach and delineations of boundaries may be useful as a 'management tool' due to a catchment's natural features and the reasons stated above (for example, defining the scope for WMPs and policies), there are, however, setbacks and some other issues such as climate change take place outside these boundaries and areas.

The case of Apia Catchment reinforces that greater attention of government officials is needed to look at the coordination across levels and scales. Working across multiple levels and scales is an important aspect to address the questions of the mismatch between catchment boundaries and relevant policysheds and problemsheds: as a result it becomes clear that not all actions/policies/rules should or must take place at one scale i.e. the catchment. One of the major findings that emerged from this study is that most of the challenges that the government officials mentioned and encountered on the implementation of catchment management relate to village engagement and involvement. This reveals the importance of local people involvement and perceptions towards the successful implementation of catchment management. But it also revealed the complexity in catchment management as there are different levels (for instance, the village level and at a finer scale the household level) involved. This can complicate this scale of management i.e. the catchment. For example, developing a collective catchment by-law is economical for the government but not so appropriate in the eyes of the some village groups specifically the untitled men's group. This is because there are different individual villages with different governance systems being aggregated at a new scale, the power-sharing governance implications of which do not appear to have been fully recognised.

8.3   Implications for the future implementation of catchment management

An important implication of the research for the future implementation of catchment management is the mismatch in catchment, administrative and land tenure boundaries, despite the clear expression that all water resources of Samoa are governed under the WRM Act 2008 and managed by MNRE. There is a strong belief and mind set of the local people towards the ownership of their land. This could be a dilemma as land is considered a very important aspect for the local villages as its conditions are well stated in the Constitution of the country (see section 2.2.4). Although the government has moved in with the purchasing of critical land areas, this approach is considered very expensive. In addition, the main institutional agency i.e. WRD, is still in its early stage of establishment even though catchment management has been around for some time. Much of the current catchment approaches are still to be established and are ahead of the statutory framework that should underpin their official establishments. For example, the catchment boundaries are not legal, therefore the legitimacy of Catchment Committees' representation and the scope of their functions are currently unclear or undefined.

8.4   Potential future areas of research

Several interesting topics for future research arose during this study:

- As this study was only looking at the urban catchment areas, it would be interesting to learn and investigate **catchment scale management in other parts of Samoa** i.e. learning about the rural communities and how they interact with and perceive this water management approach. Obtaining knowledge on the perspectives of people in these rural areas would be interesting and would provide a comparison between rural areas and urban areas or between villages outside Apia Catchment boundaries that are getting water from these water intakes (SWA operated) located within Apia Catchment.

- The results showed that catchment scale management was very much promoted by overseas developing partners. In Samoa, most of the developing partners, such as UNDP, UNEP, EU etc. have local headquarters. For further investigation into this topic, including some of these overseas partners in the choice of interview participants would be fascinating i.e. **investigating achievements or challenges of this approach based on these regional organisations' guidelines** to see if the local government ministries and NGOs experience similar challenges and perceptions of implementation of catchment management.

- **Local NGOs and catchment management.** During the research, only one local NGO i.e. IWSA was able to participate and be interviewed. According to MNRE officials, new emerging NGOs such as the Plumbers Association and the Samoa Red Cross (see Figure 2-3) have recently become more involved in water resources management programmes. With

these newly established NGOs an exploration of how they can relate, adopt or see catchment management is worth exploring to provide an insight into this unit of management and to see how this approach works for them.

- **How does catchment management deal with inter-village relations**? Going back to the conceptual framework, this study has focused mainly on the interactions between government at the national level and villages at the local level i.e. the vertical interaction between the two levels of the spatial scale. Future research needs to focus on the interaction between the different entities of the same level i.e. between villages at the local level to see how this catchment approach influences different village's interactions with one another. This research provides some insight on this area and indicated a deeper investigation is warranted.

- **Progress of catchment management implementation in Apia Catchment**. In the future, looking at the progress made at the Apia Catchment in terms of its adoption of catchment management will be imperative.

8.5   Recommendations for water resource managers

This study has identified several recommendations for water resource managers.

- Firstly, whether catchment management is appropriate or not for the case of Samoa, cultural aspects are important and the government should prioritize these, for example the pre-existing decision body i.e. village council (fono a le nuu) at the village level. The results highlight the need for catchment scale advocators to engage more with the villages. Even though, according to a government interviewee, IWRM has led to more community engagement, the findings highlight that a gap exists between government officials and the villages and that needs attention. Both village councils and government ministries need to agree on the mechanisms used to manage and govern water resource.

- As stated in the recommendations for future research, the government is currently focused on implementation of catchment scale management i.e. the vertical interplay or cross level - from the government to each catchment. But the important issues arising from this research, which were raised by the untitled men target groups, is the interplay or interactions between each village within the catchments. These are individual entities at the same level. The government should also consider the different interests of different water users and community groups at each village within catchments, because each group sees integrated approaches differently.

- Another recommendation would be to strengthen water related ministries or organisations' communications and relationships by sharing information on water resources management issues. Purchase of critical land areas in the upland areas should be continue, and Electric Power Cooperation (EPC) and Samoa Water Authority (SWA) should contribute by cost–sharing of these activities.

- Although consulting individual villages is seen as an expensive activity, especially with cultural obligations such as ava (kava) ceremony and monetary gifts for the villages. Even so, these should not be skipped over by government ministries by inviting just a few members to a venue in the city for community consultation. This approach might be economically advantageous for the government and overseas aid resources but if only a few village members are invited that is a smaller number compared to the more people involved if the consultations are held at the villages.

- Finally, this study has also generated an opportunity for water managers to reflect on how this universally appealing catchment scale management works in practice. Hence, it provides water managers with empirical resources (albeit limited to two Apia Catchment villages) to consider that what often works or is assumed to work in overseas countries might not be applicable or might need to be appropriately adjusted to Samoa's social, economic and political context.

8.6 Overall summary

This study has evaluated catchment scale management in Samoa by focusing on Apia Catchment. The study has collected and identified many aspects of how villages perceive and interact with the approaches that government officials are using to sustainably manage water resources. Hence, the study has investigated two levels of administrative and spatial scale and how they are interacting. Government officials' interviews reflect government expectations of successful implementation of catchment management and a resultant integration of villages into sub-catchments. However, communities have different views and reactions. These are important insights for water resources decision-makers and policy-makers who need to understand how a globally appealing approach works in different contexts such as a small island nation. Some of the findings in this research may only relate to Samoa, such as the land tenure issue. Nevertheless, it does provide an outlook of different perceptions towards this approach, and the implications it imposes on communities and water resources management. The concerns of the Apia Catchment local communities are most likely the same in other small island nations where there are pre-existing social systems and cultural values. This study helps strengthen the importance of exploring and recognising the different cultural entities, values and practices involved in water resources management and governance.

Overall, the results of this study reveal the complex nature of water resources but also the importance of deeper considerations of how policies are to be implemented and imposed across existing social and cultural scales.

Appendix 1- Research Information Sheet

Waterways Centre for Freshwater Management
University of Canterbury/Lincoln University
Private Bag 4800
Christchurch 8140, NEW ZEALAND
Ph: +64 3 3642330

Information Sheet for Semi-structure Interview

This research explores the applicability and workability of the **catchment management** as a conceptual and analytical tool in Samoa's water resources management context. This boundary - defining concept has been enshrined in what is known as Integrated Water Resources Management (IWRM) framework emphasizing catchment as the natural unit for planning, governing and management of water resources. The ultimate aim of this research is to investigate the implementation of catchment management in water governance and management in Samoa and communities perceptions on it particularly in the Apia Catchment area.

Your involvement in the interview session is **voluntary and will take approximately 1 hour** and will be held in your office or any place suitable and convenient for you. There are no anticipated risks for this research however; if you feel uncomfortable at any stage of the study, you have the right to withdraw from the study including any information provided before the data analysis starts in January 2015. The sessions will be recorded with a digital audio device given your consent and approval. If you do not wish to be recorded, only handwritten notes will be taken.

Following our discussion you will not be asked to participate in any follow up activity except on points of clarification that may arise. The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation, your identities will not be made public without your consents. To ensure anonymity and confidentiality the following steps will be taken; 1) your personal identity (names) will translated into identification codes with all the related information collect and maintained using pseudonyms within the thesis final write-up. The information collected will be stored in a secure computer and all written transcripts and notes will be kept in a locked cabinet at the researchers' office in Samoa, until return to New Zealand where the information will be store securely by the University of Canterbury. The only person(s) who will have access to this information will be the primary researcher and supervisors. A thesis is a public document and will be available through the UC Library.

This research is being carried out as a requirement for a Master's Degree in Water Resources Management. I (Toiata Uili) am the principal researcher under the supervision of Dr Ronlyn Duncan (Lincoln University), who can be contacted through email ronlyn.duncan@lincoln.ac.nz and phone number +64-3-423-0427 extension 30427. She will be pleased to discuss any concerns you may have with regard to this project.

Thank you for your cooperation and support, if more information is needed please contact me through phone numbers +685-7622961 (Samoa) or email: toiata.uili@pg.canterbury.ac.nz; ageluteine@gmail.com;

This project has been reviewed and approved by the Department/ School of Science and the UC HEC ethics process. Any complaints should be addressed to**:**

The Chair
UC Human Ethics Committee
University of Canterbury
Private Bag 4800, Christchurch
Email: human-ethics@canterbury.ac.nz

Appendix 2- Participants Consent Form

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CONSENT FORM

Please initial box

1. I confirm that I have read and understood the information sheet provided for the above study. I also agree to participate as a subject in the above-study. I understand and consent to the publication of the results of the study with knowledge that anonymity will be preserved.

2. I understand that my participation is voluntary and I may at any time withdraw from the project together with all the information I provided. This can be done before the data analysis starts in January 2015.

3. I **agree** to record my interview with a digital recorder (voice and image).

4. I **do not agree** to record my interview; however I choose to have the researcher take handwritten notes of my interview.

_____   _____   _____

Name of Participant   Date   Signature

_____   _____   _____

Researcher   Date   Signature

This project has been reviewed and approved by the Department/ School of Science and the UC HEC ethics process.
Any complaints should be addressed to:
The Chair
UC Human Ethics Committee
University of Canterbury
Private Bag 4800, Christchurch
Email: hunman-ethics@canterbury.ac.nz

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