Identification and valuation of ecosystem services in the Mount Apo Natural Park, the Philippines, as a basis for exploring the potential of ‘payments for environmental services’ for protected area management

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Declaration of originality

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed:  Date: 07 August 2015

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List of abbreviations and acronyms

ANOVA	Analysis of variance
AUD	Australian dollar
CI	Conservation International
CIFOR	Center for International Forestry Research
CVM	Contingent valuation method
DENR	Department of Environment and Natural Resources
DOT	Department of Tourism
EcoGov	Environmental governance project
EDC	Energy Development Corporation
FAO	Food and Agriculture Organisation
GMP	General management plan
GIZ	Gesellschaft für Internationale Zusammenarbeit
IUCN	International Union for the Conservation of Nature
IP	Indigenous people
IPAF	Integrated protected area fund
LWUA	Local Water Utilities Administration
MANP	Mount Apo Natural Park
NCIP	National Commission on Indigenous Peoples
NIPAS	National integrated protected areas system
NGO	Non-government organisation
NRC	National Research Council
PAMB	Protected area management board
PASu	Protected area superintendent
PAWB	Protected Areas and Wildlife Bureau
PAWCZMS	Protected Areas, Wildlife and Coastal Zone Management Services
PES	Payment for environmental services
PhP	Philippine Peso
PNOC	Philippine National Oil Company
RA	Republic Act
TCM	Travel cost method
TEV	Total economic value
UNEP	United Nations Environment Programme
WCMC	World Conservation Monitoring Centre
WTP	Willingness to pay

Abstract

Protected areas are the cornerstone of global biodiversity conservation. In the Philippines, the establishment of protected areas is intended to protect biodiversity and other natural resources and values. Protected area management in the Philippines is severely hampered by a funding shortfall. This research was designed to explore whether users and beneficiaries of ecosystem services delivered by one protected area in particular, the Mount Apo Natural Park (MANP), were deriving a consumer surplus and were willing to pay for more environmental services to be delivered in the MANP.

The research developed a new understanding of (i) the types of ecosystem services delivered the by the MANP, (ii) value of individual services and the total economic value of the MANP, and (iii) how various payment for environmental services (PES) schemes could add financial resources for the management of the MANP and deliver livelihoods for people living within or adjacent to the MANP.

The research adopted a mixed-methods approach, using quantitative research in the form of a contingent valuation survey of resource users and beneficiaries (household water users, climbers and the general public) as the primary method. The survey included qualitative components and extensive consultations were also undertaken with stakeholder representatives.

The research provides empirical evidence that users and beneficiaries of the MANP ecosystem goods and services derive unpaid benefits from watershed protection, recreation, and biodiversity conservation. The resulting lower-bound estimate of the total economic value of the MANP was PhP 6482 million (AUD 152.5 million) annually or PhP 118 thousand (AUD 2774) per hectare (in 2010 prices). The research reveals that there is clear potential for PES schemes to generate funds in support of effective management of the MANP. PES schemes for watershed protection or to support recreational values present the greatest potential as payment mechanisms already exist. A PES scheme for biodiversity conservation is likely to be the most challenging to design.

Recommendations are provided, based on survey results and international literature, for developing PES schemes to support effective protected area management in the Philippines, in the context of the MANP case study.

1 Introduction

1.1 Problem statement

Protected areas are the cornerstone of biodiversity conservation efforts (Kalamandeen & Gillson 2007; Leroux et al. 2010). They play a critical role in safeguarding global biodiversity (Armsworth et al. 2011; Geldmann et al. 2013; Leroux et al. 2010; Mallari et al. 2013; Monzón, Moyer-Horner & Palamar 2011; Spear et al. 2013; Stoll-Kleemann 2010; Wells & McShane 2004). However, the benefits from protected areas extend beyond biodiversity conservation. Protected areas provide a suite of other ecosystem services such as watershed protection, carbon storage, recreational opportunities, knowledge generation, and cultural and spiritual services (Chape, Spalding & Jenkins 2008; DeFries et al. 2007).

As of 2011, the global protected area network includes more than 150,000 sites with a total land area of at least 24 million square kilometres (km^2) that covers more than 15% of the earth's land surface (IUCN and UNEP-WCMC 2012). It is projected that global land protection can reach 29% of the earth's surface by year 2030 (McDonald & Boucher 2011).

Protected areas are generally established by government decree. The decisions of governments to establish or expand national protected area systems indicate national and/or global recognition of the value of ecosystem services provided by those areas (Chape, Spalding & Jenkins 2008). As the scarcity of natural areas increases, so does the value of the ecosystem services that they provide (McDonald & Boucher 2011; Viglizzo et al. 2012).

In order to preserve biodiversity and other ecosystem services, there has to be active management of protected areas. Management includes onsite conservation and restoration activities, monitoring and enforcement. It may also be necessary to compensate local communities to forego certain land uses to improve effectiveness of park management (Bruner et al. 2001; Lu et al. 2006; Thur 2010; Traoré et al. 2013). Management needs are determined by geographic, ecological and socio-economic characteristics of protected areas (Armsworth et al. 2011). Most protected areas are managed by government agencies, although there are protected areas that are privately managed, including those managed by non-government organisations (Armsworth et al. 2011; Chape, Spalding & Jenkins 2008).

Effective management of protected areas requires sufficient funding (Bruner et al. 2001; Dearden, Bennett & Johnston 2005; DENR-PAWB 2012; Green et al. 2012; Leverington et al. 2010; Wilkie, Carpenter & Zhang 2001). Typically, funding comes from government allocations and private donations or grants from international funding agencies. In the Philippines, at least 80% of total funds for protected area management comes from such sources (DENR-PAWB 2012). In many situations, particularly in low and middle-income countries[1], protected areas receive insufficient funding (Chape, Spalding & Jenkins 2008; Dearden, Bennett & Johnston 2005; Green et al. 2012; Inamdar et al. 1999). In some developing countries, including the Philippines, the estimated funding shortfall can be as high as 70% of actual management needs (Bruner et al. 2001; DENR-PAWB 2012).

Closing the funding shortfall from the public purse is a challenge that necessitates the exploration of user and beneficiary pays mechanisms to generate additional revenue that can be utilised for protected area management. The additional revenue can also facilitate the design of potential payment for environmental services (PES) schemes to improve management (Inamdar et al. 1999; Kareiva, Chang & Marvier 2008; Meijerink 2008; Pirard 2012a).

A PES scheme facilitates the additional provision of ecosystem services through conditional payments to voluntary service providers (Muradian & Rival 2012; Tacconi 2012). Most PES programs are directed towards private landowners. Since governments are also landholders, it is possible to design PES programs, partially or completely, for public lands such as protected areas (Engel, Pagiola & Wunder 2008; Tacconi 2012).This is of particular relevance in the Philippines where establishment of protected areas has been a cornerstone of conservation efforts and where indigenous communities have historically resided in many areas prior to their proclamation as protected areas. In such situations, community involvement is recognised as critical to the effective management of protected areas (Dearden, Bennett & Johnston 2005; Gorner & Cihar 2013). PES schemes offer the potential for active community involvement in management.

A crucial foundation in designing PES schemes is an understanding of the economic values of ecosystem services (Whittington & Pagiola 2012). PES is not directed at conserving natural assets solely based on their economic values (Tacconi 2012) and does not always require extensive economic valuation of the full suite of ecosystem services (Wunder 2007). However, the feasibility of designing PES schemes is better

[1] As defined by the World Bank, http://data.worldbank.org/about/country-classifications

informed by how users and beneficiaries value ecosystem services (von Haaren et al. 2012; Whittington & Pagiola 2012).

1.2 Research questions

The Philippines is one of the world's 17 "mega-diversity" countries that account for two-thirds of the earth's biological diversity. The country is also one of 34 global biodiversity hotspots, indicating a high level of threat for the country's biodiversity and endemism (CI Philippines, DENR-PAWB & Haribon Foundation 2006), which is the result of the continued high rate of population growth coupled with rapid economic development.

The establishment of protected areas is a cornerstone of the Philippine government's efforts at conservation of the country's natural assets. The enactment of Republic Act 7586, known as National Integrated Protected Areas Systems (NIPAS) Act of 2002, is a key part of the implementation of conservation policies (DENR-PAWB 2012; Subade 2007). The NIPAS Act provides the legal framework for the delineation, establishment, and management of protected areas throughout the Philippines, including the establishment of the integrated protected areas fund (IPAF). As of 1st January 2013, 240 protected areas covering more than five million hectares of land and sea (approximately 14% of the Philippines' total land area) had been established through the NIPAS Act (DENR-PAWB 2013).

Protected area management is a priority area for environmental management in the Philippines (World Bank 2005). The appropriate management of protected areas is hindered by the lack of baseline scientific information, including the values of the resources and services provided by protected areas (Mallari et al. 2013). As elsewhere, there is a shortfall of government funding for effective protected area management (DENR-PAWB 2012; DENR-PAWB and GIZ 2011; World Bank 2005). A recent review of the state of the protected area management in Philippines recognises the potential of exploring payment for environmental services as a sustainable means of generating funds (DENR-PAWB 2012).

This research explores the values of ecosystem services provided by a protected area in the Philippines and the scope for payments for ecosystem services to improve protected area management. Towards this general goal, this research uses the Mount Apo Natural Park (MANP) as a case study.

The MANP has a total land area of approximately 641 km^2. It is listed in the United Nations' National Parks and Equivalent Reserves and is a heritage site of the

Association of Southeast Asian Nations. The MANP is within the territorial jurisdiction of Davao del Sur and North Cotabato Provinces in the southern part of Mindanao, Philippines. MANP is selected as a case study because of the significance of its ecosystem services such as biodiversity, water provision, and recreation opportunities. The specific reasons for selecting the MANP as a case study are:

(1) As home of endemism in Mindanao, MANP is a conservation priority area in the Philippines (CI Philippines, DENR-PAWB & Haribon Foundation 2006);

(2) MANP is internationally significant as an important bird area and heritage site of the Association of Southeast Asian Nations;

(3) MANP has iconic status because its defining feature is Mount Apo, the Philippines' highest mountain;

(4) MANP is the source of drinking water for major population centres in Mindanao; and

(5) MANP suffers from funding shortfalls and shows symptoms of ineffective management (such as illegal logging, land conversion and wildlife hunting); this necessitates tapping additional sources of revenue which then requires an understanding of the value of ecosystem services.

This research focuses on three ecosystem services: biodiversity conservation, water provision and recreational values. This research aims to answer the following questions:

(1) What are the ecosystem services values and the resulting total economic value of the MANP?

    a. What is the value of biodiversity conservation at the MANP?

    b. What is the value of water provision by the MANP?

    c. What is the recreational value of the MANP?

(2) What is the potential of PES, funded by user/beneficiary pays mechanisms, to support more effective management of the MANP and to safeguard its breadth of ecosystem services?

1.3 Contributions of the research

This research contributes to the field of ecosystem services valuation and PES design, and also delivers tangible knowledge and advice for protected area management of the MANP, specifically, and the Philippines more broadly. Some specific contributions of this research are:

(1) This is the first study to estimate the value of multiple ecosystem services provided by a protected area in the Philippines;

(2) This is the first research to estimate the total economic value of a Philippine protected area based on empirical data;

(3) This research develops the concepts of user/beneficiary payment mechanisms to address the funding shortfall for protected area management;

(4) This research presents concepts of PES that actively engage key stakeholders in protected area management;

(5) This research estimates the value of multiple ecosystem services concurrently;

(6) This is one of few studies to utilise ecosystem service values as foundations of PES design for protected area management, and the first of this kind in the Philippines;

(7) This research utilises and compares different empirical approaches in the estimation of ecosystem values; and

(8) This research compares the results of different econometric models for ecosystem value estimation.

1.4 Organisation of the thesis

The thesis is organised into eleven chapters, as shown in Figure 1-1. Chapter 2 explores the conceptual and theoretical context of the research relating to protected area management, payment for environmental services, and total economic value. Chapter 3 presents a detailed description of the case study, the Mount Apo Natural Park. This chapter represents the first part of the methodology and is presented as a separate chapter due to the necessity of providing contextual details about the case

study. Chapter 4 presents in detail the empirical and analytical methodologies of the research.

Chapters 5 through 9 present the results of the research; these chapters start with a chapter synopsis. Chapter 5 presents descriptive results about the research respondents. Chapters 6-8 estimate the values that resource users and beneficiaries attribute to the three ecosystem services, measured as willingness to pay. Chapter 9 estimates the total economic values of the MANP, which is an integration of the results presented in Chapters 5 to 8.

Chapter 10 discusses the methodological validity of the results and the implications of the research results for potential PES schemes for the MANP in the context of the framework presented in earlier chapters. Finally, Chapter 11 draws conclusions from the research and offers possible directions for future research.

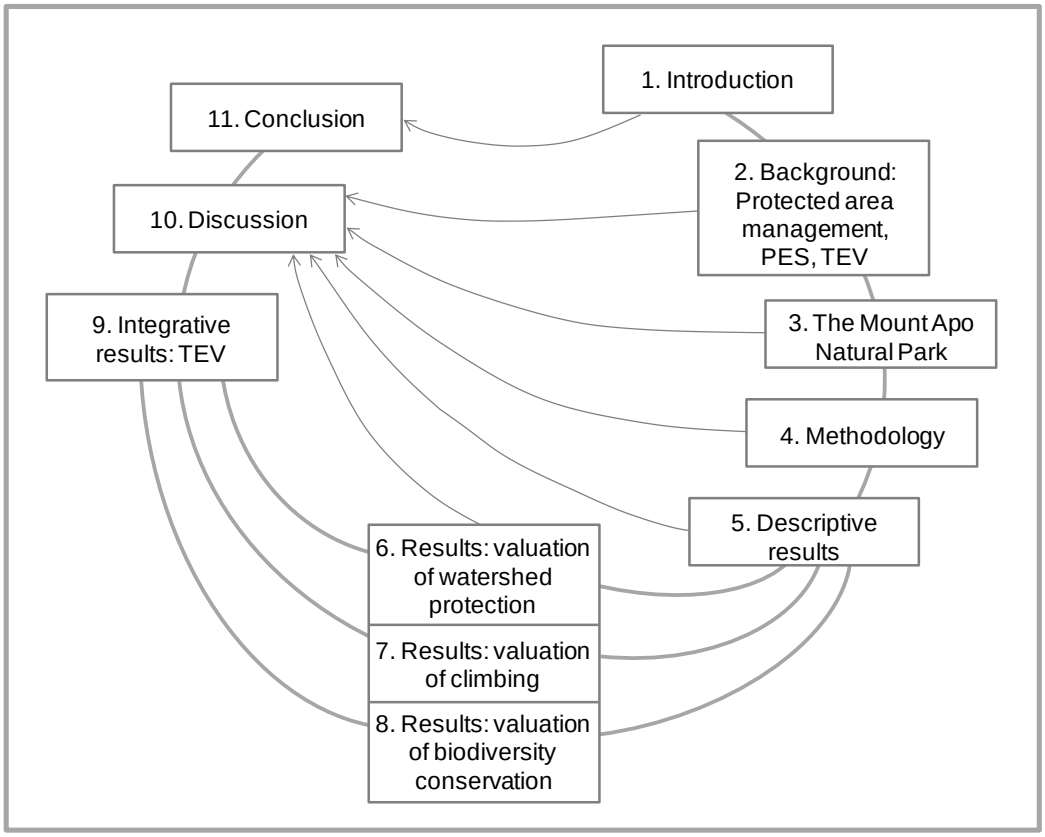

Figure 1-1: Arrangement of thesis content, in chapters

2 Context: Protected area management, payments for ecosystem services and economic value

2.1 Chapter synopsis

This chapter presents the conceptual and theoretical context of the research. Figure 2-1 shows the conceptual framework of the research. Protected areas provide ecosystem goods and services that deliver wellbeing benefits to society directly or indirectly. This, in turn, requires authorities and designated managers to manage protected areas actively. Where funding from consolidated government revenues is insufficient to provide for management, payments for ecosystem services by users and beneficiaries can generate additional revenue and support adequate and effective strategies and actions that can be implemented for management of protected areas to safeguard the ongoing provision of ecosystem goods and services (Spangenberg et al. 2014).

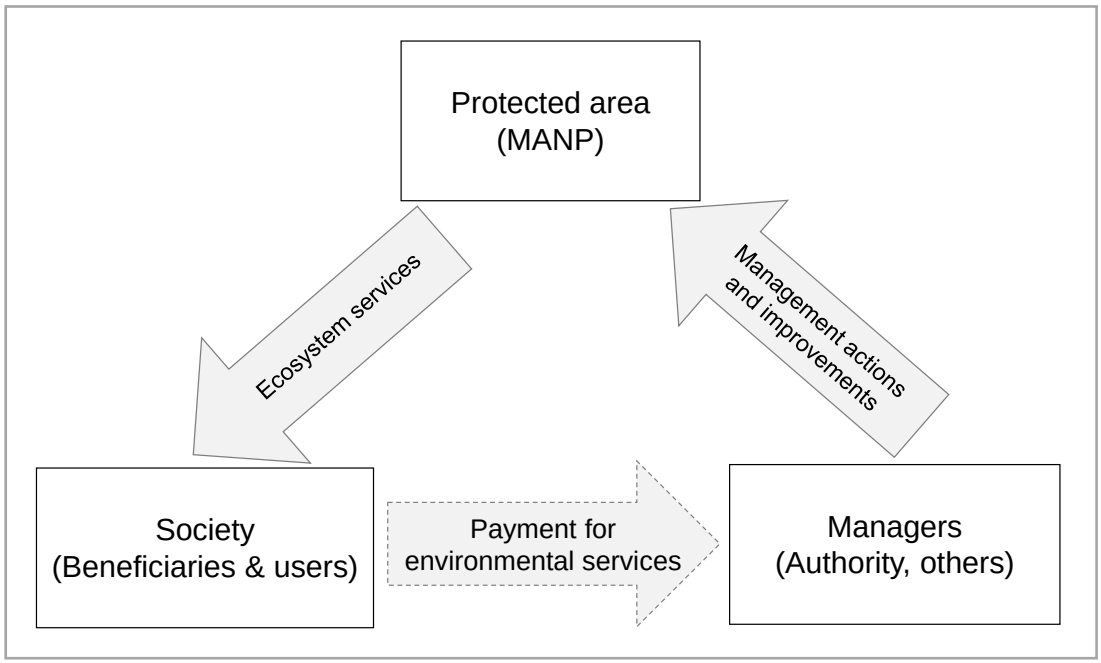

Figure 2-1: Conceptual framework: Relationship between protected area management and payment for environmental services

Adapted from Greiner, Gordon and Cocklin (2009, p. 54)

An understanding and quantification of the values of goods and services that society derives from protected areas can be helpful in determining what types of user/beneficiary contributions may be feasible, what monetary value the contributions may take and how much supplemental funding for protected area management may be generated. The chapter is divided into three sections. Section 2.2 reviews literature on protected area management, Section 2.3 presents the concept of economic values of ecosystem goods and services, and Section 2.4 explores the concept and applications of payment for environmental services.

2.2 Protected area management

The International Union for Conservation of Nature (IUCN) defines a protected area as “a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (Day et al. 2012, p. 9). Protected areas have to be properly managed to achieve the objectives of their establishment, which is to safeguard the natural environment and to continue provide society with nature’s benefits (Blom 2000; Carranza et al. 2014; Castley, Hill & Pickering 2009; Cook, Carter & Hockings 2014; Green et al. 2012; Healy & McDonagh 2009; Vuohelainen et al. 2012). Management of protected areas is primarily targeted towards biodiversity conservation (Armsworth et al. 2011; Carranza et al. 2014; Green et al. 2012; Kolahi et al. 2014; Nepal 2002; Spear et al. 2013; Traoré et al. 2013; Wilkie, Carpenter & Zhang 2001). Some protected areas are also managed for other benefits, such as carbon sequestration, water provision and nature-based recreation (Blom 2000; Broadbent et al. 2012; Castley, Hill & Pickering 2009; Gorner & Cihar 2013; Healy & McDonagh 2009; Inamdar et al. 1999; Moore & Polley 2007; Vuohelainen et al. 2012; Xu et al. 2009).

Protected areas are managed primarily by government departments, particularly in developing countries (e.g., Kolahi et al. 2013; Lu et al. 2006; Negi & Nautiya 2003; Othman & Mohd Zin 2013; Satumanatpan et al. 2014; Simpson & Bugna 2001; To et al. 2012). There are also protected areas that are managed by private organisations, such as non-government organisations (NGOs) that focus on conservation (Armsworth et al. 2011; Chape, Spalding & Jenkins 2008; Nyahunzvi 2014; Pegas & Castley 2014).

Protected area management generally involves onsite conservation, restoration, enforcement and monitoring (Broadbent et al. 2012; Kolahi et al. 2013; Stoll-Kleemann 2010; Vuohelainen et al. 2012). Generic activities in protected area

management include demarcation and patrolling of protected area boundaries, capacity building of staff, purchase of necessary equipment, and information and education campaigns (Kolahi et al.2013; Leverington et al. 2010; Niedziałkowski et al. 2014; Togridou, Hovardas & Pantis 2006). Activities that relate directly to the ecosystem services provided by protected areas include, for example, reforestation for biodiversity conservation, watershed protection and carbon sequestration (Broadbent et al. 2012; Vuohelainen et al. 2012), monitoring and protection of species (Traoré et al. 2013; Xu et al. 2009) and, for nature-based recreation, visitor monitoring, trail maintenance and maintenance of visitor centres (Castley, Hill & Pickering 2009; Healy & McDonagh 2009; Ingram et al. 2014; Moore & Polley 2007).

Among the critical requirements for effective protected area management are sufficient funding (Armsworth et al. 2011) and local community support (Granderson 2011; Healy & McDonagh 2009; Vuohelainen et al. 2012; Xu et al. 2009). Chronic lack of funding is a major challenge for protected areas worldwide, whether owned and managed by the government or private organisations (Armsworth et al. 2011; Green et al. 2012; Inamdar et al. 1999; Kolahi et al. 2014; Togridou, Hovardas & Pantis 2006; Whitelaw, King & Tolkach 2014; Wilkie, Carpenter & Zhang 2001).

Local communities are usually primary stakeholders of protected areas and their support can be critical to the sustainability of protected areas (Granderson 2011; Healy & McDonagh 2009). Lack of community support or conflict with protected area managers can arise when communities lack awareness about biodiversity, park managers and authorities neglect local communities in decision-making, or the establishment of the protected area is perceived to result in inequitable distribution of benefits or disadvantage the community by curtailing their resource utilisation or means of livelihood (Corbera, Kosoy & Martínez Tuna 2007; Cortina-Villar et al. 2012; Hirschnitz-Garbers & Stoll-Kleemann 2011; Kolahi et al. 2014; Negi & Nautiya 2003; Niedziałkowski et al. 2014; Traoré et al. 2013).

Local community participation in protected area management is very important because human activities in surrounding areas can have a strong influence on biodiversity conservation efforts and on the actual costs of protected area management (Balmford et al. 2002; Green et al. 2012; Spear et al. 2013). This is particularly the case where people either reside within the boundaries of protected areas or in surrounding areas, or where there is heavy dependence on natural resources for livelihoods (Andam et al. 2010; Defries et al. 2007; Ferraro, Hanauer & Sims 2011; Lambi et al. 2012; Vedeld et al. 2012).

The problem of funding shortages necessitate exploring innovative means of generating financial resources for protected area management, such as user/beneficiary co-payment schemes (Inamdar et al. 1999; Whitelaw, King & Tolkach 2014). Mechanisms should also be in place for local community participation in order to minimise conflicts that undermine effective protected area management (Granderson 2011; Mannigel 2008; Vuohelainen et al. 2012; Xu et al. 2009). PES schemes offer the potential to generate supplemental funds and can also provide a vehicle for local communication and participation in protected area management (Fisher et al. 2014; Whitelaw, King & Tolkach 2014).

2.3 Economic value of ecosystem goods and services

Ecosystems are valuable because they provide goods and services that are crucial to human wellbeing (Figueroa & Pasten 2013). The value of global ecosystem goods and services is estimated to range from US$125 trillion per year to US$145 trillion per year (in 2007 prices) (Costanza et al. 2014). These values represent nature's contribution to human well-being, either through direct consumption of, or indirect benefits from, global ecosystem goods and services. For protected areas, the value of ecosystem goods and services is largely determined by specific contexts. For example, it is estimated that Chile's national protected area system generates ecosystem goods and services to the value of US$2.55 billion per year (in 2005 prices) (Figueroa & Pasten 2013), while the value of ecosystem goods and services protected areas in Romania is estimated at €13.47 billion per year (in 2012 prices) (Popa et al. 2013).

2.3.1 The need for valuation

Ecosystem goods and services are not traded in conventional markets and cannot be valued in terms that are comparable to manufactured capital (Costanza, R. et al. 1997). Accurate valuation of all benefits that society derive from nature may not be feasible due the complexity of ecosystem goods and services, many of which are public goods or common-pool resources (Barbier et al. 2009; Chee 2004; Figueroa & Pasten 2013; Garrod & Willis 1999; Morse-Jones et al. 2011). However, understanding and quantifying the value of ecosystem goods and services are necessary for designing effective policies for the management of natural areas (Turner, Morse-Jones & Fisher 2010; Viglizzo et al. 2012), such as user or beneficiary co-payment schemes.

The relevance of the economic valuation of ecosystem goods and services lies in its usefulness in generating information to support the decision making process (Winkler 2006). Biller, Rogge and Ruta (2006) identified three key purposes of economic valuation: (1) economic valuation facilitates better decision making by assisting in priority setting through the provision of systematic and consistent approaches to policy problems; (2) economic valuation provides information relevant to the interested parties that facilitates estimation of the benefits and costs of ecosystem goods and services; and (3) economic valuation presents a consistent approach to the estimation of the level of policy instruments that target market failures. Thus, economic valuation makes it possible to design institutional market instruments (such as payments for ecosystem services, taxes and access charges) that promote the efficient allocation of resources and sustainable ecosystem management (Barbier et al. 2009; Chee 2004).

2.3.2 Total economic value

The concept of total economic value (TEV) is a well-established and useful framework for identifying the various values associated with environmental goods and services, including those in protected areas (Popa et al. 2013). Figure 2-2 shows the components of the total economic value of a protected area. The TEV concept indicates that the economic value of protected areas is more than the use values of the resource (Francisco 2004), and includes non-use and option values.

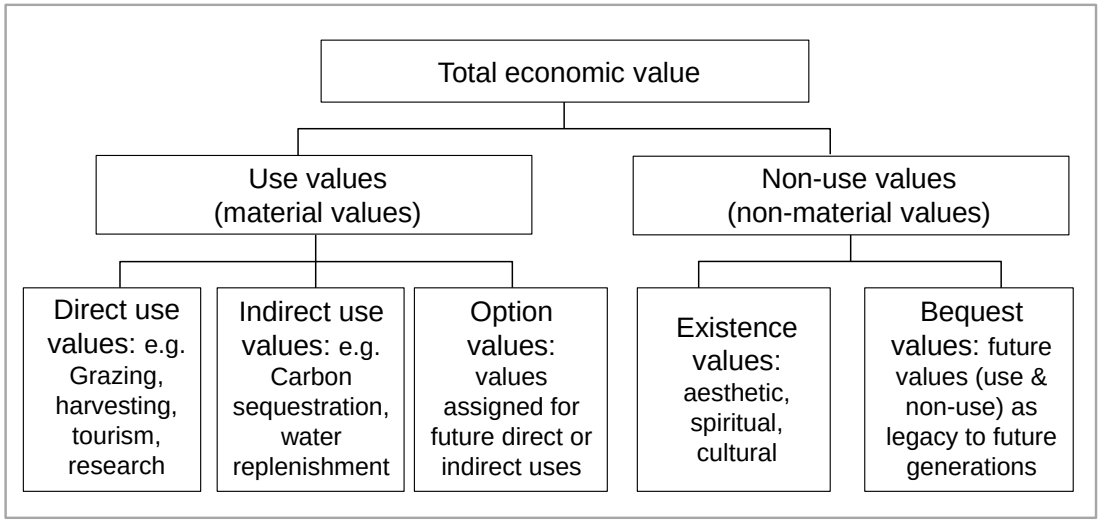

Figure 2-2: Concept of total economic value of protected areas

Source: Chape, Spalding and Jenkins (2008, p. 15)

2.3.2.1 Use values

Use values reflect the value of direct and indirect benefits derived from protected areas. Some direct benefits are timber and non-timber forest products for livelihoods (Cortina-Villar et al. 2012; Negi & Nautiya 2003; Niedziałkowski et al. 2014; Traoré et al. 2013; Xu et al. 2009), safe drinking water (Almendarez-Hernández et al. 2013) and recreation opportunities (Becken & Job 2014; Blom 2000; Castley, Hill & Pickering 2009; Healy & McDonagh 2009). Nature-based tourism in protected areas also provides supplemental income to local communities (Gorner & Cihar 2013; Xu et al. 2009). Protected areas can also improve clean air and water for communities (Corbera, Kosoy & Martínez Tuna 2007; Inamdar et al. 1999; Vuohelainen et al. 2012). Indirect benefits relate to the values of the ecological functions of protected areas, such as the protection of soils and regulation of watersheds (Adger et al. 1995; Torras 2000).

2.3.2.2 Option values

Option value is the value people place on preserving an option to use the protected area in the future even if it is not currently being used (Tietenberg & Lewis 2012). Option value is reflected by the price that individuals are willing to pay for the conservation of resources because of their possible use in the future (Chee 2004; Plottu & Plottu 2007). Two of the best examples as to why option values are important are future discoveries for medicinal and agricultural uses of plants, and future findings of new ecological benefits contributed by the protected areas (Torras 2000). The option values of protected areas can be derived from, for example, future biomedical use of biodiversity (Inamdar et al. 1999) or future nature-based tourism activities (Blom 2000; Broadbent et al. 2012).

2.3.2.3 Non-use values

Non-use values are the most elusive type of value because they are derived from motivations other than an individual's personal use and are, therefore, less tangible than use values (Tietenberg & Lewis 2012; Torras 2000). Non-use values have two components, namely bequest and existence values. Bequest value is an indicator of the satisfaction that individuals derive from knowing that resources are preserved for future generations (Chee 2004; Plottu & Plottu 2007). Existence value is the value attached to the knowledge that species, natural environments and other ecosystem services exist and are being preserved, independent of any present use or intended future use (Chee 2004; Plottu & Plottu 2007). Chape, Spalding and Jenkins (2008) suggest that existence value is composed of aesthetic value, spiritual value, and

cultural value. Aesthetic value represents an appreciation of the harmony, beauty, and profound meaning found in nature. Spiritual values indicate that individuals derive inspiration from being able to relate with reverence to the sacredness of nature. Cultural values represent the values attached to sites by individuals or different social groups, including the associated traditions, beliefs, or value systems that fulfil their need to understand and connect in meaningful ways to the environment and the rest of nature.

The existence value of protected areas may be reflected in funding solely for biodiversity conservation (Armsworth et al. 2011; Green et al. 2012; Nepal 2002; Spear et al. 2013; Wilkie, Carpenter & Zhang 2001). Another indicator of the existence value of protected areas is society's willingness to pay for biodiversity conservation in protected areas that they do not even intend to visit (Kolahi et al. 2014).

2.4 Payments for environmental services

The term PES has been referred to in the literature as either payment for ecosystem services (Bremer, Farley & Lopez-Carr 2014; Farley & Costanza 2010; Goldman-Benner et al. 2012; Ingram et al. 2014; Layton & Siikamaki 2009; Petrescu 2014) or payment for environmental services (Ferraro 2008; Greiner, Gordon & Cocklin 2009; Kroeger 2012; Pagiola 2008; Sommerville, Jones & Milner-Gulland 2009; Tacconi 2012; Vatn 2010; Wunder 2005). The terms are often used interchangeably, implying that ecosystem services and environmental services are synonymous. However, ecosystem services are conceptually different from environmental services (Derissen & Latacz-Lohmann 2013; Greiner, Gordon & Cocklin 2009).

Ecosystem services are derived from natural capital while environmental services are provided by actors. Ecosystem services "focus on the wellbeing benefits provided to society from natural capital" while environmental services "focus on the efforts undertaken by actors to generate environmental improvements and improved natural capital" (Greiner, Gordon & Cocklin 2009, p. 54). Thus, this research adopts PES to mean 'payment for environmental services' because "…nature does not need to be paid (and cannot technically be paid) for the flow of goods and services provided to humankind…only humans can be paid (and in many cases need to be paid) for the provision of environmental benefits…" (Derissen & Latacz-Lohmann 2013, p. 14).

2.4.1 Concept and definitions

PES schemes are policy instruments designed to enhance or modify the behavior of natural resource managers to maintain or recreate the supply of ecosystem services through the provision of economic and other incentives to service providers (Corbera, Soberanis & Brown 2009; Jack, Kousky & Sims 2008; Lockie 2013; Milder, Scherr & Bracer 2010; Muradian & Rival 2012; Tacconi 2012; Vatn 2010). Unlike command-and-control mechanisms, which tend to prescribe the same level of activity to all environmental service providers, PES programs can be context-specific and flexible (Engel, Pagiola & Wunder 2008).

PES is defined in various ways. One of the most cited is Wunder's (2005, p. 3) definition of PES as "a [1] *voluntary* transaction where [2] a *well-defined* ES (or a land-use likely to secure that service) [3] is being 'bought' by a (minimum one) ES *buyer* [4] from a (minimum one) ES *provider* [5] if and only if the ES provider secures ES provision (*conditionality*)". More recently, PES had been defined more broadly as "a transparent system for the additional provision of environmental services through conditional payments to voluntary providers" (Tacconi 2012, p. 35). PES is also broadly defined as "… a transfer of resources between social actors, which aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources" (Muradian et al. 2010, p. 1205).

PES provides the potential to protect and enhance ecosystem goods and services by linking ecosystem users and beneficiaries to environmental service providers through payment options and voluntary arrangements (Lurie et al. 2013). As a policy instrument, the major goal of PES schemes is "to buy as much environmental outcome (ecosystem services) and associated human wellbeing gain as possible for scarce public and private funding" (Greiner & Stanley 2013, p. 4).

2.4.2 Actors in payment for environmental services schemes

The implementation of PES programs involves a variety of actors (Bennett et al. 2014; Schomers & Matzdorf 2013). The three major groups of actors in PES programs are: (1) users/beneficiaries, (2) sellers/service providers, and (3) intermediaries.

Users/beneficiaries are those who either directly use or indirectly benefit from ecosystem goods and services. For hydrological goods and services, the users/beneficiaries are water users (household water users, commercial water users

and farmers who rely on irrigation) and even timber consumers (e.g., Bennett 2008; Cortina-Villar et al. 2012; Muñoz Escobar, Hollaender & Pineda Weffer 2013; Schmitt et al. 2013; Wunder & Albán 2008). The users/beneficiaries of landscape beauty include tourists and private tour operators (e.g.,Frost & Bond 2008). For carbon storage and biodiversity conservation, beneficiaries can include local and global communities (e.g., Frost & Bond 2008; Ingram et al. 2014; Sommerville et al. 2010).

Sellers/service providers are those who are in a position to influence the delivery of ecosystem services. The majority of PES programs are aimed at private landholders (including farmers) but can include governments because they can also be intended for public lands, such as protected areas (Corbera, Kosoy & Martínez Tuna 2007; Engel, Pagiola & Wunder 2008). Local communities that have either joint property rights or use and management rights to land may act as collective environmental service providers (Bremer et al. 2014; Rojahn & Engel 2005, cited in Engel, Pagiola & Wunder 2008).

In developing countries, the participation of farmers and small landowners in PES programs is influenced by several factors, such as compensation (payments), non-monetary benefits, availability and access to information, perspectives on conservation practices, land use restrictions and support for initial costs of adoption (Balderas Torres et al. 2013a; Bremer, Farley & Lopez-Carr 2014; Fisher 2012; Kosoy, Corbera & Brown 2008; Kwayu, Sallu & Paavola 2014).

Intermediaries are third parties that facilitate transactions between ecosystem service users/beneficiaries and environmental services sellers/providers. The major roles of intermediaries can involve information exchange, program design, mediation, project administration and coordination (Huber-Stearns, Goldstein & Duke 2013; Pham et al. 2010; Sattler & Matzdorf 2013). Intermediaries can be instrumental in the success or failure of PES programs (Cremaschi, Lasco & Delfino 2013; Ingram et al. 2014; Sattler et al. 2013). Common intermediaries are government agencies (e.g., Bennett 2008; Bertke & Marggraf 2005; Cortina-Villar et al. 2012; Cremaschi, Lasco & Delfino 2013; Dobbs & Pretty 2008; Pagiola 2008), non-government organisations (e.g.,Asquith, Vargas & Wunder 2008; Wunder & Albán 2008) and water utilities (e.g., Bennett et al. 2014; Lurie et al. 2013; Moreno-Sanchez et al. 2012; Muñoz Escobar, Hollaender & Pineda Weffer 2013).

2.4.3 Sources of funding

There are two basic types of PES programs according to the source of funding: user-financed PES programs and government-financed PES programs (Engel, Pagiola &

Wunder 2008; Whittington & Pagiola 2012). In a user-financed PES program, service providers are paid by service users and beneficiaries. Government-financed programs collectively refer to PES schemes in which service providers are paid from funds provided by third parties, typically a government or donor agency.

An example of a user-financed PES scheme that is the product of direct negotiation between service users and service providers is the Vittel PES program in France. In this case, Nestle Waters directly pay farmers to modify their farming practices to avoid the risk of nitrate contamination and ensure good quality water for use by the company (Perrot-Maître 2006). User-financed PES programs have the two major advantages: (1) service users and beneficiaries provide both funding and information on their valuation of the services, and (2) service users and beneficiaries can observe if they are actually receiving the desired services, which offers service providers a strong incentive to ensure that payments are used effectively (Ingram et al. 2014; Pagiola, Arcenas & Platais 2005).

Government-financed PES programs usually cover much larger areas and may be more cost-effective than user-financed PES programs because of economies of scale in transaction costs. Government-financed programs are also more effective in addressing free riders by charging compulsory user fees (Engel, Pagiola & Wunder 2008) . A review of PES programs worldwide revealed that, as of 2009, about 93% of those programs are government-financed (Milder, Scherr & Bracer 2010). A major challenge in government-financed PES programs is their efficiency since governments are unlikely to have direct information regarding service value or whether services are actually being provided (Engel, Pagiola & Wunder 2008; Whittington & Pagiola 2012). Another concern with government-financed programs is the risk of discontinuation of PES funding when an election results in a change of government (Greiner & Stanley 2013; Wunder 2005).

2.4.4 Payment schemes

There are several aspects of payment in PES programs, including the mode of payment, form of payment and timing or frequency of payment (Sattler et al. 2013). In terms of the mode of payment, a PES scheme is either input-based or output-based. Input-based payment is also referred to as area-based and output-based payment is alternatively referred to as result-based, outcome-oriented, product-based, or performance-based payment (Derissen & Quaas 2013; Schomers & Matzdorf 2013). Thus, output-based payments are payment for ecosystem services, while input-based payments are payment for environmental services.

In input-based schemes, the payment is granted for a certain land-use or management activity that is assumed to deliver the desired ES. Examples include payment per hectare of land covered by the program or payment per working hour invested into agreed management activities (Alix-Garcia, De Janvry & Sadoulet 2008). In output-based schemes, payment is directly linked to the ecosystem service provision, such as metric tons of water additionally withheld in a watershed or tons of carbon sequestered or species of birds protected (Ingram et al. 2014; Sattler et al. 2013; Wunder, Engel & Pagiola 2008).

In contrast with input-based payments, output-based payments can be more effective because payments are linked to the actual provision of environmental services. The disadvantage is a higher risk for the service provider because the generation of output can be influenced by uncontrollable and complex factors such as weather. There is also the disadvantage of higher costs associated with monitoring and measurement of environmental service provisions (Sattler et al. 2013). A combination of input-based and output-based payments may be needed for some PES schemes to be successful (Derissen & Quaas 2013).

Forms of payment can be cash, in-kind or a combination of cash and in-kind payments (e.g., Asquith, Vargas & Wunder 2008; Cortina-Villar et al. 2012; Ferraro 2008; Moreno-Sanchez et al. 2012; Sommerville et al. 2010). In-kind payment include the materials necessary for the conduct of agreed management activities and technical assistance to service providers.

Payment is usually periodic, such as annual or monthly payments (e.g., Bennett 2008; Muñoz Escobar, Hollaender & Pineda Weffer 2013; Sommerville 2010) . There are situations when a one-off payment is considered more appropriate, such as upfront payment when a large investment is necessary prior to the actual implementation of a PES program, or after the provision of an environmental service is confirmed (Bohlen et al. 2009).

2.4.5 Phases of payment for environmental services design

Sattler and Matzdorf (2013) identify four phases of PES model design and discuss the issues that arise at each phase. The four phases are: (1) exploration phase; (2) development phase; (3) pilot testing; and (4) program operation. Table 2-1 summarises the focus of and relevant issues for each phase.

Table 2-1: Phases of payment for environmental services design

Phase	Focus	Sample specific issue
1. Exploration	Overall situation analysis, collection and analysis of information relevant to future PES	• What is the problem and can a PES provide a viable solution? • What is the basic goal with respect to the ES? (e.g., improvement in quality or quantity) • Who are the potential ES providers/ sellers? • Who are the potential ES beneficiaries/users? • Is an intermediary necessary? • Who are the stakeholders to be • involved in the PES development process? • What are the likely transaction costs?
2. Development	Negotiating and figuring out the components and governance structures	• What are the final goods of the PES? • How should the ES provision be measured? • What are the ES-related property rights? • What is the payment structure? • What is the duration of the contract?
3. Pilot testing	All activities necessary to test the PES after completion of negotiation between parties and signing of contracts Careful monitoring of PES	• Do ES providers deliver as agreed? • Do ES beneficiaries/buyers pay as agreed? • Do intermediaries facilitate the smooth transactions?
4. Programme operation	PES operationalisation at full scale	• Is there any contract infringement? • Does the programme run according to defined goals? • Is there a need to renegotiate

Source: Sattler and Matzdorf (2013, p. 7)

2.4.6 Examples of payment for environmental services programs in developing countries

PES programs have been developed globally to support four general categories of environmental services: watershed protection, biodiversity conservation, carbon sequestration and storage, and nature-based recreation opportunities (Datta 2009; Wunder 2005; Wunder, Engel & Pagiola 2008; Wünscher, Engel & Wunder 2008). A review of PES programs implemented worldwide reveal a wide variation of PES schemes. Some PES programs are directed towards a particular environmental service, such as watershed protection or biodiversity conservation (Ingram et al.

2014; Schmitt et al. 2013; Sommerville et al. 2010; Whittington & Pagiola 2012; Wunder & Albán 2008) , while others target two or more environmental services (e.g., Asquith, Vargas & Wunder 2008; Claassen, Cattaneo & Johansson 2008; Ingram et al. 2014; Molina Murillo, Pérez Castillo & Herrera Ugalde 2014; Moreno-Sanchez et al. 2012; Pagiola 2008; Wunder & Wertz-Kanounnikoff 2009).

Some PES schemes are implemented at the local or micro level, while others are implemented at the national level; the most commonly cited national PES program is that of Costa Rica (Bennett 2008; Ingram et al. 2014; Molina Murillo, Pérez Castillo & Herrera Ugalde 2014; Southgate & Wunder 2009). There are also PES programs that target conservation priority areas, such as wildlife reserves and protected areas (Cortina-Villar et al. 2012; Ingram et al. 2014; Sommerville et al. 2010).

Table 2-2 shows examples of various types of PES scheme. Studies suggest that geographic coverage influences the effectiveness of PES schemes, with local or community-based programs generally more effective than PES programs with national coverage (Cortina-Villar et al. 2012; Ingram et al. 2014; Southgate & Wunder 2009). This supports the assertion that spatial targeting should be an important consideration in PES design (Southgate et al. 2010; Wendland et al. 2010; Wünscher, Engel & Wunder 2008).

The PES programs in protected areas in Tanzania, Guatemala and Cambodia involve active community participation from design to implementation; the programs indicate the specific activities that are paid for and the conditionality for payment. The successful implementation of PES programs show that biodiversity conservation can be reconciled with improvement in community well-being (Ingram et al. 2014). PES programs that do not involve community participation in the development phase may result in widespread perceptions of neglect and inequity. When conditionality for payment is not well-established, community perceptions of neglect and inequity increases the likelihood of non-compliance (Sommerville et al. 2010; Southgate & Wunder 2009). These examples indicate that PES programs can be effective mechanisms for involving the local community in decision making, which is considered a critical component of effective protected area management (Healy & McDonagh 2009; Hind, Hiponia & Gray 2010; Kolahi et al. 2013; Niedziałkowski et al. 2014).

Table 2-2: Examples of payment for environmental services applications in developing countries

PES program, country (Source)	Environmental service		Source of funding	User and/or beneficiary	Service provider	Intermediary	Payment to service providers	
	Targeted	Paid for					Payment	Timing of payment
Community-based PES, Madagascar (Sommerville et al. 2010)	Biodiversity conservation	Habitat management	Conservation NGO	Conservation NGO	Local communities	Conservation NGO, local community forest association	In-kind	Annual (conditionality not indicated)
Community-based PES, Guatemala (Ingram et al. 2014)	Biodiversity conservation	Conservation of wild turkey	Users	Wild turkey hunters	Local communities	Private companies	Cash	Every hunting trip, conditional on number of turkey hunted
Community-based protection, Simanjiro Plains, Tanzania (Ingram et al. 2014)	Biodiversity conservation	Protection of wildlife habitat	Users	Private tourism operators	Local communities	Private tourism operator, NGO, village-level management board	Cash	Annual (conditionality not indicated)
PES in Northern Plains, Cambodia (Ingram et al. 2014)	Biodiversity conservation, nature-based recreation	Wildlife-friendly agriculture, ban on hunting for subsistence	Users	International tourists	Local communities	Protected area authorities, NGO, locally-elected village committee	Cash	During visit, conditional on number of bird species sighted
Payments for Hydrological Environmental Services (PSAH), Mexico (Cortina-Villar et al. 2012)	Watershed protection	Forest protection in protected areas	Government	Water users	Individual and communal and landowners	Government (state forest agency)	Cash	Annual (conditionality not indicated)
Payment for watershed services, Pinampiro, Ecuador (Southgate & Wunder 2009)	Watershed protection	Protection and regeneration of natural forest	Users	Metered water users	Members of upland farmers' cooperative	Municipal government	Cash	Monthly payment (conditionality not indicated)
Payment for watershed protection, Colombian Andes, Colombia (Moreno-Sanchez et al. 2012)	Watershed protection, biodiversity conservation	Preservation of natural forest and riparian vegetation	Users	Households and recreational water users	Upland farmers	Water management boards	Cash	Annual (conditionality not indicated)

Various PES programs implemented in developing countries show the possibility of improving biodiversity conservation and watershed protection while providing affected communities with economic, social or institutional benefits (Ingram et al. 2014; Molina Murillo, Pérez Castillo & Herrera Ugalde 2014; Southgate & Wunder 2009). At the same time, PES programs also pose the potential for risk of leakage. For example, a PES program aimed at controlling deforestation in one area can result in increased deforestation in surrounding areas not included in the program (Cortina-Villar et al. 2012). There can also be an issue with “free riders”, which involves certain individuals or groups benefiting from the program, but not paying for those benefits (Southgate & Wunder 2009).

Examples of PES programs provide insights into the benefits and challenges of implementation, as well as the potential for PES schemes to generate funds for protected area management in developing countries. The examples also lend partial support to the assertion that PES schemes contribute to well-being (Fisher et al. 2014).

3 Case study: The Mount Apo Natural Park

3.1 General information about the Philippines

The Philippines is an ecologically rich and diverse archipelago located in Southeast Asia. It is bounded on the north by the Luzon Strait, on the south by the Celebes Sea, on the west by the China Sea, and on the east by the Philippine Sea. Its nearest neighbours are Malaysia and Indonesia to the south (Figure 3-1). The Philippines is the world's second largest archipelago, next to Indonesia, and is located along the Ring of Fire[2]. The land area of about 30 million hectares is spread across more than 7,100 islands in three major island groups of Luzon, Visayas and Mindanao.

The Philippines is one of 18 "mega diverse" countries in the world, which together host two thirds of the world's biodiversity (Ong, Afuang & Rosell-Ambal 2002). The Philippines' tropical forests are among the most biodiverse in the world, and is home to 5% of the world's flora, including at least 25 genera of plants and 49% of terrestrial animal species. The country is also considered a biodiversity hotspot because of the high rate of destruction of natural ecosystems and the resulting large number of endangered and threatened species. This makes the Philippines one of the leading global conservation priority areas (DENR-PAWB 2009).

The Philippines had one of the highest rates of deforestation in the world. In the early 1900s, the Philippines had about 70% forest cover; but in late 1980's only 23% remained (DENR-PAWB 2009). In the early 1990s, deforestation was estimated to be occurring at an annual average rate of 3.5% of forest cover. Recent forest statistics indicate some improvement, with data compiled by the Food and Agriculture Organisation (FAO 2010) showing an increase in forest cover in the Philippines (Table 3-1). However, this is attributed mainly to changes in the international definition of forest adopted from the FAO[3], although there has been some natural regeneration and plantings on both private and public lands.

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[2] http://www.worldatlas.com/webimage/ countrys/asia/ph.htm

[3] Forest is defined as "land spanning more than 0.5 hectare with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly agricultural or urban land use." (FAO 2012, p. 5).

By law, all natural resources in the Philippines belong to the state (Section 2, 1987 Philippine Constitution). The conservation and management of natural resources generally rests with the government, primarily the Department of Environment and Natural Resources (DENR) (Carandang 2012). Local government units also share responsibility in natural resource conservation and management, as prescribed by the Local Government Code of 1991.

Figure 3-1: Geographic location of the Philippines

Source: Google maps, 2014

Table 3-1: Philippine forest cover, 1990-2010

Year	Forest cover ('000 hectare)	Forest cover as % of total area
1990	6570	21.9%
2000	7117	23.7%
2005	7391	24.6%
2010	7665	25.6%

Source: FAO (2010, p. 11)

One of the landmark legislations enacted by the Philippine government was the National Integrated Protected Areas Systems (NIPAS) Act of 1992, which provides the legal framework for the establishment of protected areas throughout the country. This law was anchored on the government's recognition of the importance of protecting the Philippines' natural resources to "...secure for the Filipino people of present and future generations the perpetual existence of all native plants and animals through the establishment of a comprehensive system of integrated protected areas..." (Section 2, NIPAS Act).

3.2 Protected area management in the Philippines

Under the NIPAS Act, a protected area refers to "identified portions of land and water set aside by reason of their unique physical and biological significance, management to enhance biological diversity and protected against destructive human exploitation" (Section 4, item b). The establishment of protected areas is the centrepiece of the Philippine government's strategy to conserve the country's biodiversity, "with the aim of achieving economic growth without depleting the stock of natural resources and degrading the environment" (DENR-PAWB and GIZ 2011, p. 9). As of 2012, the Philippines has 240 protected areas that cover 5.4 million hectares of land and sea (Table 3-2), which is equivalent to 13.6% of the Philippines' total land area and 0.64% of marine territory (DENR-PAWB 2012). Natural parks/national parks comprise 25% of all protected areas.

Table 3-2: Categories of protected areas and total area protected by each category, Philippines (2012)

Category	Frequency	Total area (ha.)
Natural parks/national parks	61	1,332,268.08
Protected landscapes	35	564,622.91
Protected landscapes and seascapes	21	1,012,169.90
Protected seascapes	8	228,582.67
Natural monument/landmark	4	24,206.16
Resource reserves	2	175,999.98
Natural biotic areas	4	12,156.35
Game refuge and bird/wildlife sanctuaries	14	1,233,946.75
Watershed forest reserves/areas	56	834,632.42
Wilderness areas	12	430.00
Mangrove swamp forest reserves	23	33,143.45
Total	**240**	**5,452,158.67**

Source: DENR-PAWB 2013

Each protected area is managed by a multi-sectoral protected area management board (PAMB). The PAMB "shall be composed of the following: The Regional Executive Director under whose jurisdiction the protected area is located; one representative from the autonomous regional government, if applicable; the Provincial Development Officer; one representative from the municipal government; one representative from each barangay covering the protected area; one representative from each tribal community, if applicable; and at least three representatives from non-government organizations/local community organizations, and if necessary, one representative from other departments or national government agencies involved in protected area management" (NIPAS Act, section 11). The regional executive director of the DENR heads the PAMB. The principal role of each PAMB is to guide protected area management, e.g. by granting permission for specific activities to be conducted within the protected area. Each PAMB has a body of staff, headed by the protected area superintendent (PASu). The position of PASu serves as secretariat of the PAMB and reports to the regional executive director of the DENR (DENR-PAWB and GIZ 2011).

As with many other countries, insufficient funding is a major challenge in protected area management in the Philippines. A majority of the funds for protected area management come from government appropriation and, in some instances, external sources. For 2005-2009, approximately 74% and 11% of funding for protected area management came from the government appropriations and international sources,

respectively. The remaining 15% came from other sources, such as private donations and fees/concessions (DENR-PAWB 2012). External funding sources included the Global Environment Facility of the World Bank, the European Union, and the United Nations Development Fund. These organisations provided funds for activities to support protected area establishment and management, mainly in the form of technical assistance and capability building. Among the important external sources of funds to support protected area management included the German Federal Ministry for the Environment, Nature Conservation, and the United States Agency for International Development.

The DENR estimated that as of 2008, there was an estimated shortfall of 1478 personnel and an operating expense equivalent to about PhP350 million (approximately AUD 8.97 million) (DENR-PAWB 2012). Between 2010 and 2013, the proportion of the DENR budget allocated for protected area management increased from PhP 173.41 million to PhP 223.38 million (approximately AUD 4.08 to 5.26 million), or an average increase of 10% per year. Of the amount allocated for protected area management, more than 60% was for personnel services. Between 2010 and 2013, inflation increased at annual average rate of 3.6%.

The NIPAS Act provides for a fee system whereby charges can be imposed on users of PAs with revenues channelled back to management activities. In 2005-2009, fees collected by protected areas contributed only 11% of total funds spent for protected area management. With a shortage of funds from various sources, the DENR recognises the necessity of exploring a system of sustainable financing based on payment for environmental services (DENR-PAWB 2012).

3.3 The Mount Apo Natural Park

3.3.1 Geography and zoning

The MANP was declared a natural park[4] by virtue of Presidential Proclamation No. 882, passed on 24 September 1996. In accordance with the provisions of the NIPAS Act, the MANP is one of the initial components of the National Integrated Protected Areas Systems in 1992.[5] The passage of the Republic Act 9237 finalised the proclamation of the MANP as a protected area[6].

The MANP is considered to be a priority conservation area in the Philippines (Ong, Afuang & Rosell-Ambal 2002) and is both an important bird area (Mallari, Tabaranza & Crosby 2001) and a heritage site of the Association of Southeast Asian Nations (DENR-PAWCZMS 2013). The defining feature of the MANP is Mount Apo, the Philippines' highest mountain with a height of approximately 3140 metres. The MANP generally has steep slopes, with almost half of the area (46%) having a slope estimated at more than 50% and only 14% having a slope less than 18%.

The MANP is located in south-central Mindanao at coordinates 6°50' to 7°07' north latitude and 125°07' to 125°25' east longitude (MANP-IPAP 1996, as cited in DENR-PAWCZMS 2013), as shown in Figure 3-2. The MANP falls within the administrative jurisdiction of Region XI and Region XII in Mindanao. About three-quarters (73.6%) of the MANP is in Region XI, specifically in Davao City and Davao del Sur province (Digos City and in the municipalities of Bansalan and Sta. Cruz). The remaining 26.4% is located in Region XII, specifically in Kidapawan City and the municipalities of Makilala and Magpet in Cotababo province (Figure 3-3).

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[4] Natural Park is one of the protected area categories established under the NIPAS Act, defined as "relatively large area not materially altered by human activity where extractive resource uses are not allowed and maintained to protect outstanding natural and scenic areas of national or international significance for scientific, educational and recreational uses" (Section 4, h, NIPAS Act)

[5] Initial components of the national integrated protected areas system include all areas in the Philippines "proclaimed, designated or set aside, pursuant to a law, presidential decree, presidential proclamation or executive order as national park, game reserve, bird and wildlife sanctuary, wilderness area, strict nature reserve, watershed, mangrove reserve, fish sanctuary, natural and historical landmark, protected and managed landscape/seascape as well as identified virgin forests before the effectivity of RA 7586" (NIPAS Act, Section 5.a).

[6] The final establishment of a protected area under the NIPAS Act is through a Republic Act, passed by the Congress of the Philippines.

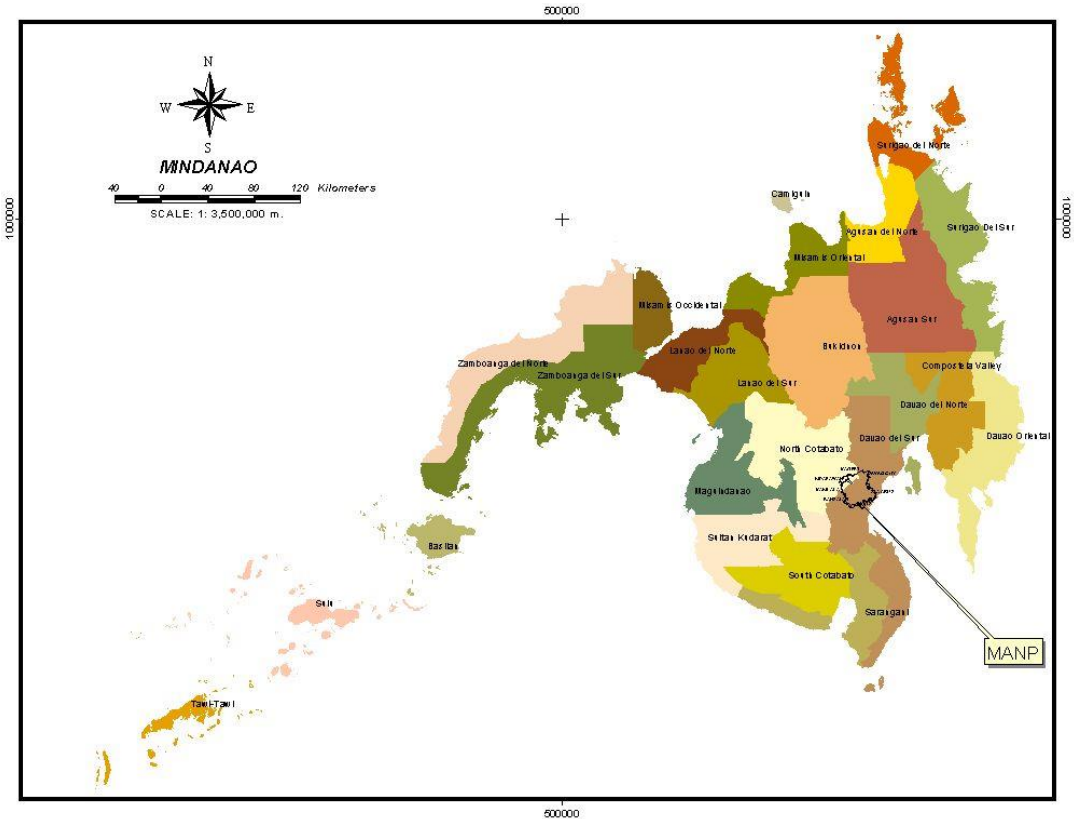

Figure 3-2: Locality map of the Mount Apo Natural Park, Mindanao, the Philippines

Source: DENR XI – Protected Areas, Wildlife and Coastal Zone Management Services

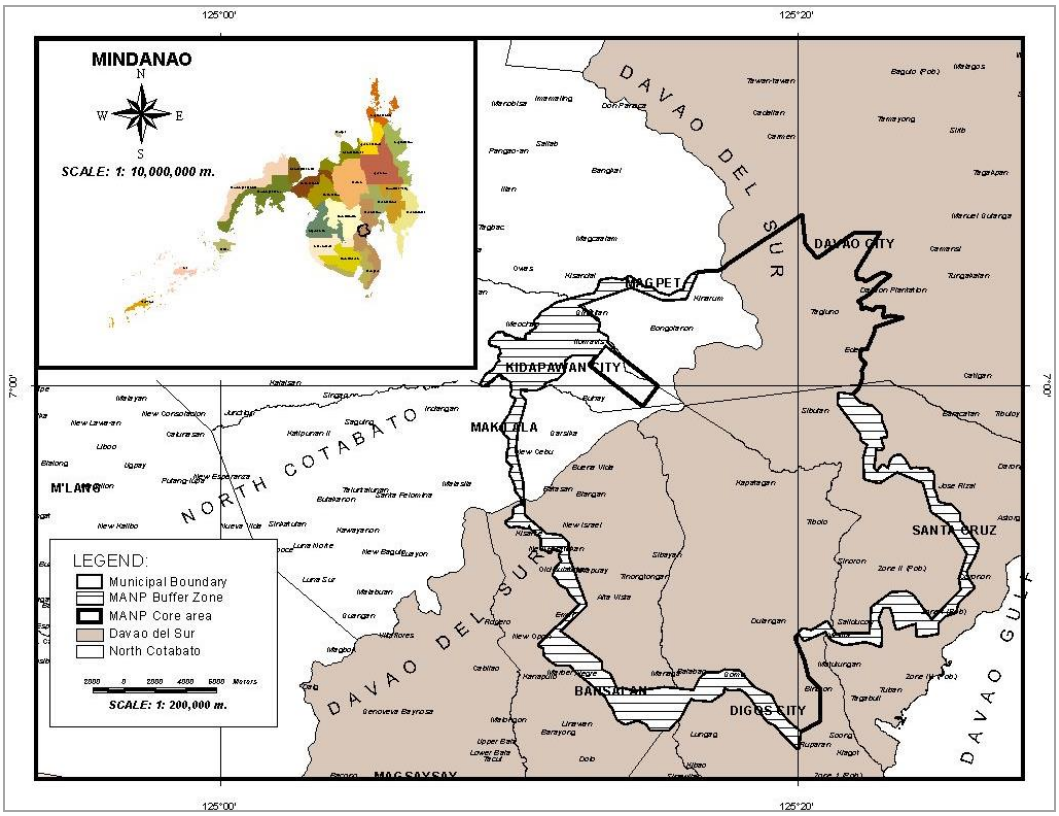

Figure 3-3: Boundary map of the Mount Apo Natural Park, Mindanao, the Philippines

Source: DENR XI – Protected Areas, Wildlife and Coastal Zone Management Services

3.3.2 Population surrounding the Mount Apo Natural Park

Table 3-3 shows the population and household distribution in the administrative areas that cover the MANP, while Table 3-4 shows the socio-demographic characteristics of the population. Between the years 2000 and 2010, the average annual growth rate of the population in Davao City, Davao del Sur and Cotabato was 2.36%, 1.36% and 2.49%, respectively.

Table 3-3: Population and households in administrative areas that cover the Mount Apo Natural Park, Mindanao, the Philippines (2010)

Administrative area	Total Population	Total Household
Davao City[1/]	1,443,890	334,473
Province of Davao del Sur[2/]		
Digos City	149,891	35,218
Municipalities of:		
Sta Cruz	81,093	18,814
Bansalan	56,496	13,389
Province of Cotabato[3/]		
Kidapawan City	125,447	28,898
Municipalities of:		
Makilala	77,508	17,233
Magpet	45,183	9,747
Total	1,979,508	457,772

Sources:

[1/]http://www.census.gov.ph/content/population-davao-city-reached-14-million-results-2010-census-population-and-housing

[2/]http://www.census.gov.ph/content/davao-del-sur-had-population-870-thousand-results-2010-census-population-and-housing

[3/]http://www.census.gov.ph/content/recorded-population-cotabato-north-cotabato-reached-12-million-results-2010-census

3.3.3 Population within the Mount Apo Natural Park

Despite the MANP being declared as a natural park under the NIPAS Act, there are at least 44 *barangays*[7] within the MANP; with 32 located in Davao del Sur and 12 in North Cotabato (DENR-PAWCZMS 2013). The *barangays* are permanent settlement areas that are inhabited by indigenous peoples and non-indigenous peoples alike.

There has been no survey of the actual population within the boundaries of the MANP (EcoGov 2008). The only indicators of the socio-demographic characteristics of the inhabitants of the MANP are national surveys conducted by the National Statistics Office. The population within the MANP is composed of indigenous peoples and migrants from other parts of Mindanao or the Visayas. Based on the 2010 census, at least 120,000 people were distributed in at least 27,000 households live within the boundaries of the MANP (Table 3-5). The major source of livelihood of the

[7] Literally means a village, the basic local government unit in the Philippines.

population is subsistence agriculture, but there is commercial agriculture in some portions of the MANP.

Table 3-4: Socio-demographic characteristics of the population in the administrative areas that cover the Mount Apo Natural Park, Mindanao, the Philippines (2010)

	Administrative area		
Variable	Davao City[1/]	Davao del Sur province[2/]	Cotabato province[3/]
Sex ratio (male:female)	1.00	1.06	1.06
Median age (years)	24.00	22.60	21.60
Average household size (persons)	4.30	4.30	4.50
Highest level of education			
Elementary level	28.50%	46.90%	42.20%
High school level	35.50%	27.70%	31.60%
Some college	12.50%	6.10%	6.80%
College graduate	14.00%	5.40%	6.40%

Sources:

[1/]http://www.census.gov.ph/content/population-davao-city-reached-14-million-results-2010-census-population-and-housing

[2/]http://www.census.gov.ph/content/davao-del-sur-had-population-870-thousand-results-2010-census-population-and-housing

[3/]http://www.census.gov.ph/content/recorded-population-cotabato-north-cotabato-reached-12-million-results-2010-census

Table 3-5: Population and households within the Mount Apo Natural Park, Mindanao, the Philippines (2010)

City/Municipality	Total population	Total households[a]
Davao City	29,113	6428
Digos City	21,944	5156
Sta. Cruz	33,972	7882
Bansalan	13,565	3215
Kidapawan City	7,578	1746
Makilala	10,297	2289
Magpet	3,558	768
Total	**120,027**	**27,483**

[a]Data for Davao City is from: http://www.census.gov.ph/content/population-davao-city-reached-14-million-results-2010-census-population-and-housing; estimates for other areas are based on 2010 census data

3.4 Ecosystem values of the Mount Apo Natural Park

3.4.1 Biodiversity

The MANP hosts terrestrial ecosystems that are typically dominated by forests, such as the lowland evergreen rainforest, lower montane rainforest, upper montane mossy or cloud forest and subalpine forest, and also grasslands and freshwater ecosystems. The MANP's lowland evergreen rainforest ranges from the footslopes to around 1200m; the area was extensively commercially logged from the 1950s to 1970s. The lower montane rainforest is the most extensive ecosystem of the MANP and ranges from elevations above 1200m up to 1800m. This ecosystem is home to several endemic bird species that are found only on a very few higher mountains in Mindanao, such as the Slaty-backed Jungle-flycatcher (*Rhinomyias goodfellowi*), the Red-eared Parrotfinch (*Erythrura coloria*) and the Apo Myna (*Basilornis Miranda*) (Mallari, Tabaranza & Crosby 2001). The upper montane mossy or cloud forest extends between about 1800m and 2600m in elevation (DENR-PAWCZMS 2013). This forest ecosystem has very steep slopes, rugged terrain, a very moist climate, constant precipitation and high humidity due to dense cloud formations. The harsh climatic conditions, the thin soils and the scarce and acidic plant nutrients at these elevations inhibit the development of shrubs into forests. The freshwater ecosystem of the MANP is composed primarily of lakes, waterfalls and river networks. Grasslands ecosystems, consisting of brushland and grassland and open areas, cover almost 36% of the MANP.

The MANP is considered the centre of endemism in Mindanao as it is a habitat for many endemic species of Philippine flora and fauna (EcoGov 2008). The MANP is also classified as a priority site for conservation and research of arthropods, a very high conservation priority area for amphibians and reptiles, and is extremely important for birds and terrestrial mammals (Ong, Afuang & Rosell-Ambal 2002). The MANP is also listed as an Important Bird Area (Mallari, Tabaranza & Crosby 2001). There is no updated comprehensive baseline information on the flora and fauna in the MANP; the major source of information is a study commissioned by the Energy Development Corporation (Dames & Moore 1994). A recent study commissioned by the Metro Kidapawan Water District (Aranico 2012) confirms the existence of endemic and vulnerable flora and fauna in portions of the MANP (see Table 3-6 and Table 3-7).

Table 3-6: Notable plant species found in the Mount Apo Natural Park, Mindanao, the Philippines

Family	Scientific Name	Common name	Use	Conservation and distribution status
Dipterocarpaceae	*Shorea almon*	Almon	Timber	Vulnerable
	Shorea contorta	White lauan	Timber	Vulnerable
	Shorea negrosensis	Red lauan	Timber	Vulnerable, endemic
	Shorea polysperma	Tanguile	Timber	Vulnerable, endemic
	Lithocarpus apoensis	Mt. Apo Ulayan	Ecological	Vulnerable, endemic
	Lithocarpus mindanensis	Mindanao oak/ Ulayan pula	Ecological	Vulnerable, endemic
	Cinnamomum barmannii	Mindanao cinnamon/ kalingat	Food flavor	Vulnerable, endemic
Liliaceae	*Lilium philippinense*	Benguet lily	Ornamental	Philippine endemic
Marantaceae	*Phrynium philippinense*	Hagithit	Ecological	Philippine endemic
Orchidaceae	*Dendrobium philippinense*	Sanggumay/latigo	Ornamental	Endemic
Rubiaceae	*Mussaenda philippica*	Kahoy-dalaga	Ornamental, ecological	Endemic
Sapotaceae	*Palaquim luzoniense*	Nato	Timber	Endemic
	Palaquim philippinense	Red nato/ Malak-malak	Timber	Vulnerable, endemic
Sellaginellaceae	*Sellaginella philippina*	Kamariang gubat	Ecological	Philippine endemic
Thelypteridaceae	*Pneumatopteris laevis*	Unknown	Ecological	Philippine endemic
	Pneumatopteris nitidula	Unknown	Ecological	Philippine endemic
	Sphaerostephanos hirsutus	Unknown	Ecological	Philippine endemic

Source: Aranico (2012)

Table 3-7: Notable animal species found in the Mount Apo Natural Park, Mindanao, the Philippines

Species	Scientific Name	Common name	Distribution Status	Conservation Status
Amphibian	*Limnonectes magnus*	Giant Philippine frog	Philippine endemic	Near Threatened
	Megophrys stejnegeri	Mindanao horned frog	Philippine endemic	Vulnerable
	Philautus acutirostris	Pointed-snouted tree frog	Philippine endemic	Vulnerable
Avifauna:Accipitridae	*Spizaetus philippensis*	Philippine hawk-eagle	Endemic	Vulnerable
Avifauna:Tytonidae	*Otus mirus*	Mindanao scops-owl	Endemic	Vulnerable
	Mimizuku gurneyi	Giant scops-owl	Endemic	Vulnerable
Avifauna:Podargidae	*Brachostomus septimus*	Philippine frogmouth	Endemic	Vulnerable
Avifauna:Muscicapidae	*Ficedula basilanica*	Little slaty flycatcher	Endemic	Vulnerable
Mammals: Pteropodidae	*Haplonycteris fischeri*	Fischer's pygmy fruit bat	Endemic	Least Concern
	Harpyionycteris whiteheadi	Harpy fruit bat	Endemic	Least Concern
	Ptenochirus minor	Lesser musky fruit bat	Endemic	Least Concern
Mammals: Muridae	*Rattus everetti*	Philippine forest rat	Endemic	Least Concern

Source: Aranico (2012)

3.4.2 Recreation

The principal recreational activity in the MANP is climbing and several trails lead to Mount Apo. The established trails include the Agco Trail in Kidapawan City, New Israel trail in Makilala, Bongolanon trail in Magpet, Kapatagan trail in Digos City, Sibulan trail in Sta. Cruz, and Bansalan trail (Figure 3-4). Recorded data from municipal tourism offices indicate that, between 2006 and 2013, there are around 3500 climbers to Mount Apo in any given year (Table 3-8). The number has likely increased with the recent opening of a new climbing trail in the municipality of Makilala. The presence of hot and cold springs also offer recreation opportunities. River rafting has been established in some areas as another form of water-based recreation.

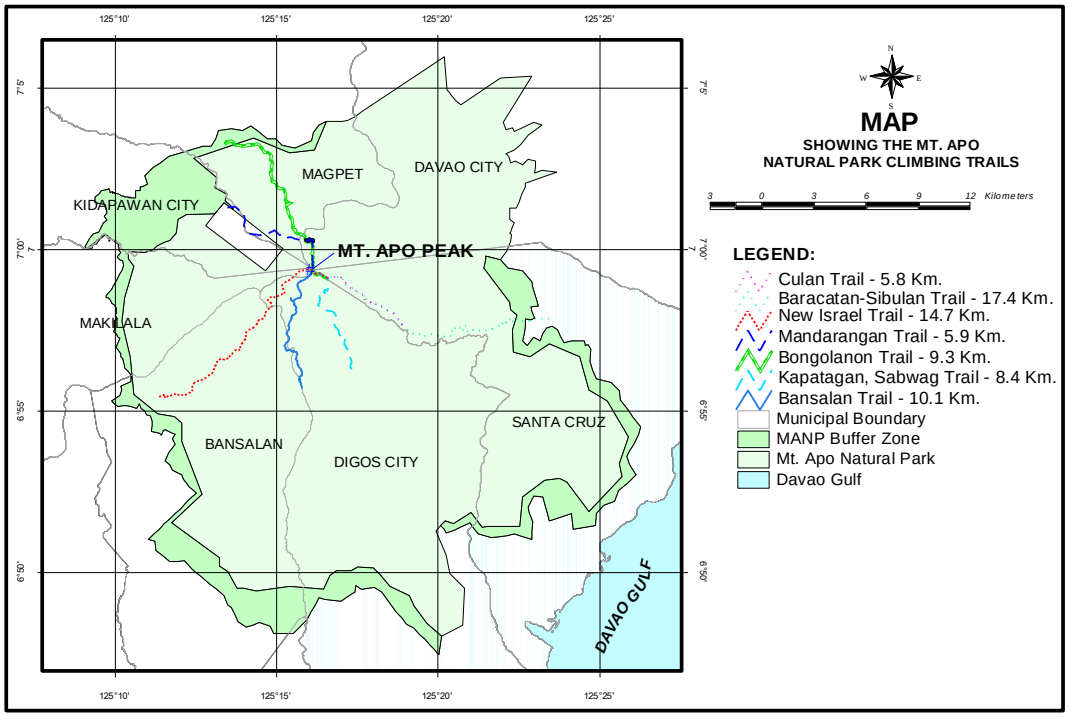

Figure 3-4: Climbing trails to Mount Apo, Mindanao, the Philippines

Source: DENR XI – Protected Areas, Wildlife and Coastal Zone Management Services

Table 3-8: Number of climbers to Mount Apo, Mindanao, the Philippines, by climbing trail and year

	Climbing trail[a/]						
Year	Kidapawan	Makilala	Magpet	Digos	Sta Cruz	Bansalan	Total
2006	142	no data	no data	250	443	no data	835
2007	no data	250	250	250	449	no data	1199
2008	868	250	250	250	373	217	2208
2009	1785	250	250	585	530	226	3626
2010	505	250	250	862	482	827	3176
2011	1718	250	250	662	531	137	3548
2012[b/]	500	250	250	250	250	250	1750
2013[b/]	500	250	250	250	250	250	1750

a/ There is no climbing trail from Davao City

b/ No actual data; estimate based on PAMB-approved carrying capacity

3.4.3 Supply of water

The MANP is one of the wettest areas in the Philippines, with average annual rainfall of approximately 2,500 millimetres (BirdLife International 2014). River systems in southern and central Mindanao are supported by numerous watersheds in the MANP. Figure 3-5 shows the watersheds within the MANP. Water resources from the MANP benefit irrigation facilities, industries and water utilities (DENR-PAWCZMS 2013). Water utilities that operate in the administrative areas surrounding the MANP provide water to commercial and household users. Water utilities in the region are based in Kidapawan City, Bansalan, Digos City and Davao City. Based on the last population census conducted in 2010, there are at least two million people who directly benefit from the water supplied by MANP watersheds. Commercial users include large soda companies and breweries. A hydro-electric power project is under development on the slopes of the MANP. Consumers of the products made by these companies, who are not limited to residing in Mindanao, represent some of the indirect beneficiaries of water from the MANP. The other indirect beneficiaries of the water supply coming from the MANP are consumers of agricultural produce from farms that benefit from irrigation water suppled from the MANP.

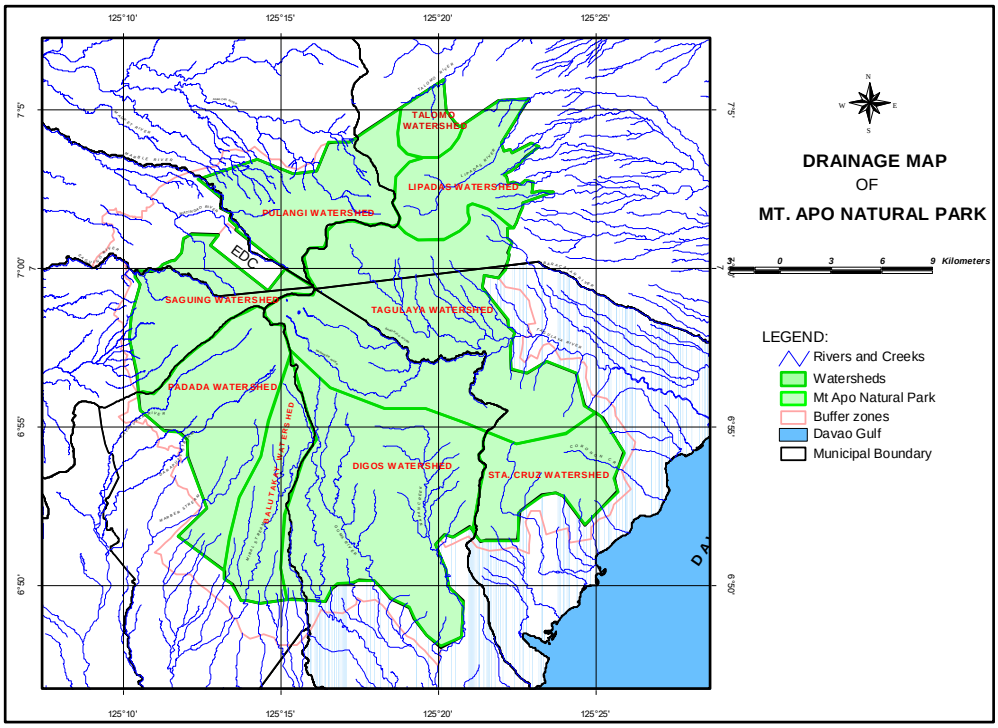

Figure 3-5: Drainage map of the Mount Apo Natural Park, Mindanao, the Philippines

Source: DENR XI – Protected Areas, Wildlife and Coastal Zone Management Services

3.5 Management of the Mount Apo Natural Park

3.5.1 Management zones

The MANP covers an area of 64,053 hectares, composed of 54,975 hectares (85.8%) of protected area and 9,078 hectares (15.2%) of buffer zones. The protected area is further classified into a core zone and a multiple-use zone. Figure 3-6 shows the different management zones of the MANP.

The NIPAS Act does not prescribe a core zone, but only specifies “protected area” and “buffer zones”. A protected area refers to “identified portions of land and water set aside by reason of their unique physical and biological significance, managed to enhance biological diversity and protected against destructive human exploitation” (Section 4.b), while buffer zones are “identified areas outside the boundaries of and immediately adjacent to designated protected areas…that need special development control in order to avoid or minimize harm to the protected area” (Section 4.c).

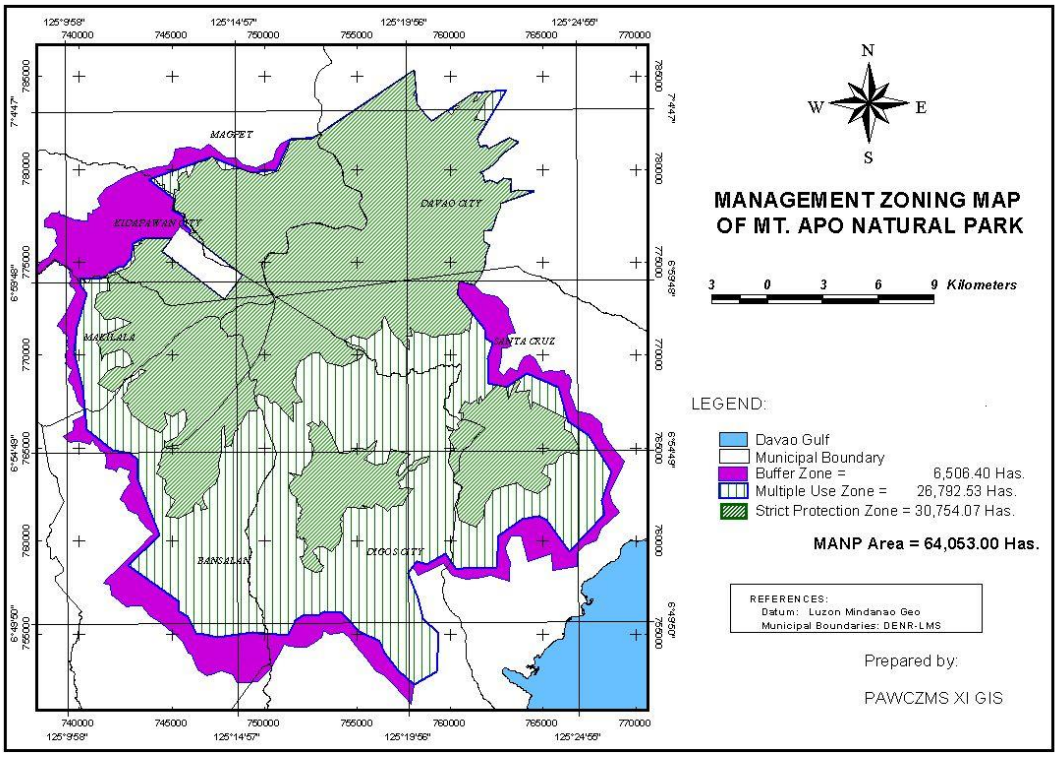

Figure 3-6: Management zones of the Mount Apo Natural Park, Mindanao, the Philippines

Source: DENR XI – Protected Areas, Wildlife and Coastal Zone Management Services

The preparation of the MANP general management plan for 2010-2030 highlighted the enormous challenge of enforcing the standards of the NIPAS Act for protected areas due to several factors. First, more than half of the total land area of the MANP is covered by ancestral domain titles that grant the indigenous peoples a certain degree of autonomy in managing the land. Second, before it was declared a protected area, some parts of the MANP already had permanent settlements where people engaged in various forms of agricultural activities and can qualify for land tenure. Thus, the protected area is further divided into two zones: the core zone and multiple-use zone. The core zone (40% of the protected area) is managed primarily for biodiversity conservation, but may also be used for research, as well as religious and ceremonial activities. The multiple-use zone covers 60% of the protected area where human settlement, agricultural development and other land uses already exist. The major goal of the zoning is the “effective management of the protected area and buffer zones and [to] promote sustainable development of all legitimate stakeholders” (DENR-PAWCZMS 2013, p. 20).

3.5.2 Stakeholders

The stakeholders of the MANP include government agencies, local government units, non-government organisations, indigenous peoples, water utilities, private energy corporations, water users, mountain climbers, other users and beneficiaries of the ecosystem services provided by the MANP. The DENR, being the Philippine government's primary agency for environment and natural resources management, is a major stakeholder in the MANP. The various natural resources and the presence of inhabitants in the protected area necessitate the involvement of other government agencies, making them stakeholders in the MANP (Table 3-9).

The local government units have the mandate to share responsibility with the national government in ensuring ecological balance in their respective jurisdictions by enacting ordinances that would advance the conservation of biodiversity, as well as the implementation of programs and projects consistent with the general management plan of the MANP. Thus, another set of stakeholders are the government officials of the administrative areas that cover the MANP. This group of stakeholders include the provincial governors of Davao del Sur and Cotabato provinces, the city mayors of Davao, Digos and Kidapawan, the municipal mayors of Santa Cruz, Bansalan, Makilala, and Magpet, and the barangay captains of the barangays that are within the boundaries of the MANP.

There are two major communities that are stakeholders of the MANP. One group is the indigenous communities that consider the MANP as their ancestral domain. Their main agenda is to claim certificate of ancestral domain titles over their ancestral domain to ensure their human and cultural wellbeing vis-à-vis efforts for ecosystem conservation and management in the MANP. Another group are the tenured migrants. These are the people who have continuously occupied public lands that are not alienable and disposable within the protected area before 1st June 1987 and are substantially dependent on the protected area (in this case the MANP) for their livelihood (Section 3, w, RA 9237). Tenured migrants are eligible to become stewards of portions of land within the designated buffer and multiple-use zones of the MANP.

Table 3-9: Government agencies that are stakeholders of the Mount Apo Natural Park, Mindanao, the Philippines

Government agency	Major mandate and service	Stake at the MANP
National Council for Indigenous People	Implementation of the IPRA	Awarding of certificate of ancestral domain title to indigenous peoples
Department of Tourism	Tourism development and implementation of tourism activities	The MANP is an important site for nature-based tourism
Department of Social Welfare and Development	Provision of basic social services	Delivery of basic social requirements of the MANP's residents
Department of Public Works and Highways	Infrastructure development	Provision of infrastructure support projects
Department of Education	Education services for elementary and secondary levels	Education for protected area residents
National Irrigation Administration	Irrigation services	Water services for irrigation
Department of Energy	Energy security	Development of geothermal energy and hydropower projects
Department of Agriculture	Food suffiency and agricultural production and enhancement	Agricultural production support to protected area residents given that a large area of the MANP has been converted into permanent agriculture
Armed Forces of the Philippines and Philippine National Police	Internal security and peace and order	Enforcement of laws

Source: EcoGov (2008, p. 178)

Another set of stakeholders are non-government organisations and other civil society groups that are implementing programs and projects in the MANP. Among this group of stakeholders are the Mount Apo Foundation Incorporated[8], the Philippine Eagle Foundation, the Kapwa Upliftment Foundation, and local mountaineering groups.

[8] The Mount Apo Foundation, Inc. was organised primarily as part of the requirements for obtaining an environmental compliance certificate of Energy Development Corporation for its geothermal energy operation in Mount Apo. The foundation is given one-centavo per kilowatt of power generated from the geothermal energy plant to fund community development initiatives within the geothermal reservation and up to a 10 kilometre-radius of the geothermal plant

Utility companies are another group of stakeholders. This group includes the various water utilities that serve areas within and outside the MANP, the Energy Development Corporation that operates a geothermal plant in portions of the Mount Apo in Kidapawan City, and Hedcor Sibulan Incorporated, a private commercial enterprise that is currently developing a hydropower project covering portions of MANP in certain areas within the municipality of Sta. Cruz in Davao del Sur province. Another Hedcor hydropower project is located in Tamugan, Davao City.

The final group of stakeholders are water users and other beneficiaries of the ecosystem services provided by the MANP, such as farmers, household water users, commercial and industrial water users, and tourists. The general public and global community also benefit from the ecosystem services provided by the MANP.

3.5.3 Governance arrangements

The Mount Apo Protected Area Act or RA 9237 is the main policy framework for the management of the MANP. RA 9237 mandates that the management of MANP ensure the protection and conservation of biodiversity, and respect and promote the interests of various indigenous cultural communities, tenured migrants and other stakeholders through sustainable and participatory development. It also provides for the creation of the multi-sectoral PAMB to serve as the highest policy making body of MANP.

The PAMB is headed by the DENR Regional Executive Director of Region XI and its members include the Regional Executive Director of DENR Region XII, governors of the provinces of Cotabato and Davao del Sur, planning and development officers of Davao City and the provinces of Cotabato and Davao del Sur, mayors of cities and municipalities that cover the MANP and all barangay captains of the barangays within the MANP. Membership also includes three representatives from indigenous communities, composed of one representative from each of the three sub-tribes (Jangan, Ubo and Tagabawa) in the MANP subject to increases when other sub-tribes are identified based on an ethnographic study by an independent institution or academe and validated by the NCIP; a maximum of eight representatives from people’s organisations and non-government organisations; representatives from national government agencies operating within the MANP; and other stakeholders that have the potential to contribute towards protected area management.

As provided in RA 9237, the PAMB of MANP has the following major powers and functions: reviews, approves and adopts proposals, management plans and development programs for the MANP; approves proposals for the budget and exercises accountability over donations, budget allocations and all other funding that

may accrue; adopts rules and procedures in the conduct of business; evaluates the performance and activities of the office of the protected area superintendent; protects the rights and privileges of indigenous peoples as provided for in RA 9237 and other applicable laws; evaluates and recommends compliance to all existing requirements set by the DENR; and monitors, evaluates and reports its assessment to the DENR regarding the performance of protected area personnel and other entities in biodiversity conservation and socio-cultural and economic development.

The protected area superintendent, as the chief operating officer of the MANP, is responsible for implementing the management plan as detailed in the annual work program, maintaining peace and order within the MANP, and exercising police supervision in the MANP. The protected area superintendent may arrest any person found within the MANP who violates provisions in RA 9237 or confiscate any forest resource or instruments that are obtained or used in violation of protected area laws.

3.5.4 Management programs and concerns

The general management plan identifies five programs that are intended to guide the effective management of the MANP: (1) biodiversity research, protection and rehabilitation; (2) indigenous peoples' affairs and cultural programs; (3) community-based resource management program; (4) participatory and community-based ecotourism programs; and (5) institutional strengthening, partnership and co-management program (DENR-PAWCZMS 2013). Implementation of these programs face two major challenges. The first is the absence of comprehensive baseline information on biological resources, as well as a socio-demographic and cultural profiles of residents of the MANP. The second is the lack of a sustainable source of funds for protected area management. As with other protected areas in the Philippines, funding for the management of the MANP largely depends on government allocations. This necessitates exploring alternative sources of funding, such as payment for PES schemes to generate financial resources.

4 Methods

The focus of this research is the provision for, and sustainable management of, ecosystem services provided by the MANP. The MANP is a multiple use and conservation area which accommodates different uses and values of a diverse range of stakeholders. However, the management of the MANP is constrained by a funding shortfall from safeguarding ecosystem services. For research to effectively contribute to a more sustainable funding and management model of the MANP, it has to consider the various stakeholder interests, quantify economic values and identify potential funding sources for conservation management. This brief, in essence, requires economic valuation to be conducted within an action research framework.

This chapter details the research methodology. Section 4.1 explains why and how an action research approach was implemented in the case study context. Section 4.3 presents an overview of the case study approach. Section 4.3 provides an overview of the concept of economic valuation of ecosystem goods and services and explains the choice of contingent valuation as a stated preference method. Section 4.4 details the empirical implementation of the contingent valuation method, data analysis and total economic value estimation.

The empirical components of the research reported here were subject to human ethics clearance by Charles Darwin University. All engagement with stakeholders and research respondents adhered to the conditions stipulated in the ethics clearance letter (reference H10001, issued on 08 April 2010; Appendix 1), which was reviewed and renewed annually. The onus was on the researcher to ensure that research participants: (i) understood the purpose of the study, (ii) voluntarily consented to their participation, (iii) were not exposed to any potential risks arising from their participation, and (iv) knew that they could withdraw their participation at any time without prejudice. Further conditions of the ethics clearance were anonymity of respondents and confidentiality of the responses that were provided.

4.1 Action research

Understanding the human dimension of environmental problems is fundamental to their solution (Bryant & Wilson 1998). After all, problems are the result of the interaction of people with the environment, specifically the manner and extent of that interaction. For solutions to be sustainable, the very people that interact with the environment, referred

to in this thesis as ‘stakeholders’, have to be consulted in developing solutions as they are the ones who will ultimately implement suggested actions. Involving stakeholders in problem definition and solution finding maximises ownership of both the problem and required action, and consequently the likelihood of an effective solution. In the Philippines, participatory approaches to natural resources management and protection have been legislated (Utting 2000).

Action research is suitable in addressing problems that requires collaborative understanding of stakeholders’ situations, needs and responsibilities. Action research is characterized by collective self-reflective inquiry undertaken by the researcher and the stakeholders (Berg & Lune 2012). The term “action research” was introduced by Kurt Lewin in 1946 as an approach to research that combines theory generation with changing the social system through researcher interaction with the social system (Susman & Evered 1978). In action research, the researcher is actively engaged producing knowledge with the participation of research stakeholders (Grønhaug & Olson 1999; Heikkilä & Kuivaniemi 2012).

Berg & Lune (2012) identify three types of action research: (i) technical/scientific/collaborative mode, (ii) practical /mutual collaborative/deliberate mode and (iii) emancipating or empowering/enhancing/critical science mode. In the technical/scientific/collaborative mode of action research, the researcher is not part of the stakeholders. The role of the researcher is to identify the problem after collaboration with stakeholders and then provide potential solution for implementation by the stakeholders. The practical /mutual collaborative/deliberate mode of action research involves collaborative working together of researcher and stakeholders in identifying potential problems, underlying causes and probable solutions and defining the problem only after mutual understanding of researcher and stakeholders. The emancipating or empowering/enhancing/critical science mode of action research “promotes emancipatory praxis in the participating stakeholders; that is, it promotes consciousness which exhibits itself in political as well as practical action to promote change” (Grundy 1987, p. 154, in Berg & Lune 2012, p. 272) .

This research adapts Berg & Lune’s (2012) technical/scientific/collaborative mode of action research. The research is designed to “blend scientific inquiry with social action by creating knowledge that is relevant to the research partners’ needs and interests” (Lingard, Albert & Levinson 2008, p. 461). Theory guides action research in analysing the problem and generating possible courses of action to address the problem (Susman & Evered 1978). Thus, the true value of a researcher in action research is possession of theory-based knowledge (Grønhaug & Olson 1999) and an appropriate

action research is anchored on stakeholder participation and understanding of their situation (Bradbury-Huang 2010; Susman & Evered 1978).

There are many advantages of increased community participation from a scientific or management perspective, including: (i) access to greater amounts of data (often larger data sets over longer periods of time) at a lower cost; (ii) increased relevance of research; such as through access to traditional or local ecological knowledge; (iii) the ability to ground-truth, refine, extend and complement scientific data; and (iv) the ability to build partnerships, community consensus and community support for initiatives (Thomsen 2008).

4.2 Case study approach

By definition, action research schemes occur in a given real-life context which therefore necessitates a case study approach. The case study approach involves using a specific case to gain insights about a general phenomenon (Howitt 2001). The central idea is that a case study is capable of analysing a range of phenomena, simple or complex, with units of analysis ranging from the individual to global communities (Berg & Lune 2012).

The purpose of a case study can range from a descriptive to an in-depth analysis that results in explanatory insights about a social phenomenon (Babbie 2011). Results of case studies provide inputs, insights, and hypotheses that may be explored by further studies or be used to infer understanding of, and solutions to, other similar situations (Berg & Lune 2012; Howitt 2001).

Howitt (2001) identifies several reasons for using a case study in resource-related research, including: (i) to gain the knowledge as a basis for understanding specific circumstances; (ii) to obtain an empirical basis for developing generalised models; (iii) to identify common ground in reaching policy directions across a range of situations; and (iv) to have a basis for decision-making.

4.2.1 Stakeholder analysis

As action research schemes involve stakeholders, the first step in this case study is stakeholder analysis. In the context of environmental management, stakeholders can be broadly defined as all those with an interest in the science and management of the environment (Mackinson et al. 2011). The concerns of stakeholders can result from institutional mandate, geographic distance, historical associations, dependence for livelihood or economic interests (Borrini-Feyerabend 1999). Stakeholders may use the

resources directly or indirectly, can have specific interests relative to the resources, and assign different values to the resources (Castellanet & Jordan 2002).

Stakeholder analysis is among the most widely used methods for analysing the characteristics of actors and policy networks in environmental management (Hermans 2008). According to Reed et al. (2009), stakeholder analysis is "a process that: (i) defines aspects of a social and natural phenomenon affected by a decision or action; (ii) identifies individuals, groups and organisations who are affected by or can affect those parts of the phenomenon (this may include non-human and non-living entities and future generations); and (iii) priorities of these individuals and groups for involvement in the decision making process."

Stakeholder analysis facilitates the generation of knowledge about relevant individuals and groups, including their behaviour, intentions, interrelations, agendas and interests, all of which influences the decision-making process (Brugha & Varvasovszky 2000). Importantly, it fosters negotiation or learning among and between stakeholders (Reed et al. 2009).

According to Grimble and Wellard (1997) there are characteristics of natural resource management that make it particularly useful for the application of stakeholder analysis. These characteristics are: (i) multiple uses and users of the resource; (ii) unclear or open access property rights; (iii) temporal trade-offs; (iv) the presence of externalities; and (v) imperfect markets. These characteristics apply in the case of the MANP.

The stakeholders of the MANP were analysed based on the MANP general management plan. Adapting the examples of Grimble and Wellard (1997) and Varvazovszky and Brugha (2000), the analysis of stakeholders of the MANP is summarised in Table 4-1.

4.2.2 Stakeholder participation

From a management perspective, benefits of stakeholder participation include: (i) allowing decision making to take different viewpoints and values into account; (ii) providing localised knowledge and solutions tailored to a specific context; and (iii) preparing the ground for effective implementation by involving all relevant actors (Berghöfer, Wittmer & Rauschmayer 2008). Similar benefits arise for research (Mackinson et al. 2011).

An analysis of 21 research projects within the United Kingdom's Research Council's Rural Economy and Land Use Programme showed that stakeholder engagement

brought significant benefits to the process of knowledge production (Phillipson et al. 2012). To fully exploit the benefits in this research, stakeholders were involved in scoping the research, the finalisation of survey instruments and data collection.

Table 4-1: Typology of stakeholders in the Mount Apo Natural Park, Mindanao, the Philippines

Institutional level	Stakeholder	Nature of involvement in MANP	Issue of interest
Global	World Bank	Funding support	Conservation
National	DENR Central Office	Management	Conservation
	DENR-PAWB	Management	Conservation
	DOT Central Office	Use	Tourism
	LWUA	Use	Water
Regional	DENR Regional Office	Management	Conservation
	DOT Regional Office	Use	Tourism
	PAMB	Management	Conservation
Provincial	DENR Provincial Office	Management	Conservation
	DOT Provincial Office	Use	Tourism
	Sub-PAMBs	Management	Conservation
	Provincial government units	Management	Political interests
Local off-site	Municipal/city government units	Management	Political interests; tourism
	Water districts	Use	Water extraction
	NGOs	Management	Conservation; land use; welfare of indigenous communities
	Downstream communities	Use	Water use; agriculture
	Mountaineering groups	Use	Tourism
	Academic institutions	Research	Education
Local onsite	Energy Development Corp.	Use	Geothermal power
	Aboitiz Group	Use	Hydropower
	Forest dwellers	Use	Habitat; livelihood
	Forest-fringe farmers	Use	Agriculture; livelihood
	IP communities	Use; existence	Habitat; livelihood

Stakeholders were consulted in identifying the core problem of the MANP (insufficient funds available for management) and a possible solution (charging fees to users and beneficiaries). They acknowledged they did not have the capacity to conduct the research that would inform decision-making on the system for collecting appropriate user/beneficiary payments that would address management concerns of the MANP. Table 4-2 shows a record of initial consultations with MANP stakeholders. Importantly, the research was negotiated with and endorsed by both the relevant state agency and protected area management organisation.

Table 4-2: Record of initial stakeholder consultations[1]

Name	Designation (at the time of consultation)	Place of consultation	Date of initial consultation
Emmanuel T. Isip	Regional technical director, DENR Region XI	Davao City	25 March 2010
Geraldine Batal	Municipal toursim officer, Bansalan	Bansalan	29 March 2010
Edgardo C. Elera	City investment promotion and tourism officer, Digos City	Digos City	29 March 2010
Rhodora Gamboa	General manager, Davao City Water District	Davao City	12 May 2010
Frederico Fino	Former staff, North Cotabato provincial planning office	Kidapawan City	14 June 2010
Marie Fe Pame	City investment tourism officer, Kidapawan City	Kidapawan City	14 June 2010
Camila Infiesto	Investment and tourism investment officer, Santa Cruz	Kidapawan City	14 June 2010
Allan Masibay	Barangay captain, Barangay Perez, Kidapawan City	Kidapawan City	14 June 2010
Efren Pinol	Municipal mayor, Magpet	Magpet	30 June 2010
Karl Jone Tanaid	Municipal toursim staff, Magpet	Magpet	5 July 2010
Edgar Paalan	City environment and natural resource officer, Kidapawan City	Kidapawan City	13 July 2010
Rodolfo Gantuangco	City mayor, Kidapawan City	Kidapawan City	20 July 2010
Walter Ruizo	Municipal environment and natural resource officer, Makilala	Makilala	29 July 2010
Rudy Coagdan	Municipal mayor, Makilala	Makilala	4 August 2010
Julius Paner	Municipal tourism staff, Santa Cruz	Sta Cruz	12 August 2010
Wilesper Lisandro Alqueza	Assistant general manager, Metro Kidapawan Water District	Kidapawan City	19 August 2010
Aileen Banog-banog	Environment protection officer, Digos City Water District	Digos City	26 August 2010
Edwin Reyes	Municipal mayor, Bansalan	Bansalan	29 August 2010
Ray Anthony Debelos	Acting watershed in-charge, Metro Kidapawan Water District	Kidapawan City	08 September 2010
Boy Abalos	Deputy barangay chairman, Kapatagan, Digos City	Kapatagan	04 December 2010
Leonilo Rivera	Former protected area superintendent, MANP	Davao City	11 February 2011
Roberto Alabado III	City planning and development officer, Davao City	Davao City	13 February 2012
Ronnie Guangco	Site watershed manager, Mount Apo Geothermal Plant	Kidapawan City	11 February 2012
Allan Barcena	Manager, watershed managemet department, EDC	Pasig City	23 February 2012
Reinerio Medrano	Manager, corporate social responsibility department, EDC	Pasig City	23 February 2012

[1]Stakeholders gave verbal permission to be identified in the research.

The research was formally presented to the PAMB during its meeting on 24 June 2010. The presentation provided the opportunity for representatives of MANP stakeholders to discuss the proposed research.

After the presentation to the PAMB, additional meetings were held with the mayors of the cities and municipalities around the MANP. This was done because most of the mayors were not present during the PAMB meeting. As with the regional technical director of the DENR, local government officials needed to be well-informed about the research because their cooperation was essential for the implementation of research activities.

Consultations with stakeholder representatives were ongoing. The majority of consultations were done during the early stages of the research. Only dates of initial consultations are shown, although most stakeholders were consulted at different stages of research implementation.

The consultations focused on providing stakeholder representatives with details about the proposed research, such as potential benefits and the implementation of research activities. The survey instruments were also explained to stakeholders. An important purpose of the consultation was to seek the support of stakeholders in the actual implementation of research activities, including the identification of potential research enumerators and the necessary precautions that were undertaken in conducting the survey.

Providing feedback to stakeholders is an important component of action research that improves overall research results (Berg & Lune 2012; Checkland & Holwell 1998; McKay & Marshall 2001) . The consultations conducted at later stages of the research were avenues for providing feedback to stakeholders about emerging research results and engaging in discussions about possible PES design.

4.3 Overview of economic valuation methods for ecosystem services

There are two general categories of economic valuation methods for environmental goods and services, namely revealed preference and stated preference methods (Freeman III, Herriges & Kling 2003). Revealed preference methods are based on actual observable choices from which monetary resource values can be directly inferred (Tietenberg & Lewis 2012). Stated preference methods are based on people's responses to carefully formulated questions in a valuation survey (Brown 2003; Turner, Morse-Jones & Fisher 2010).

Table 4-3 provides an overview of the common economic valuation methods applied to ecosystem goods and services. Detailed comparisons of the different valuation methods are presented by Barbier et al. (2009), Mendelsohn and Olmstead (2009), and Turner, Morse-Jones & Fisher (2010).

Table 4-3: Economic valuation methods of ecosystem goods and service

General classification	Specific valuation method	Type of values estimated
Revealed preference methods	Hedonic pricing	Direct and indirect use
	Travel cost method	Direct use
	Avoidance expenditure	Direct use
	Replacement/restoration cost	Indirect use
Stated preference methods	Contingent valuation	Use and non-use
	Attribute-based methods	Use and non-use
	Choice experiment	
	Contingent ranking	
	Contingent rating	
	Contingent behavior	Use and non-use

Sources: Barbier et al. (2009); Freeman III, Herriges and Kling (2003); Garrod and Willis (1999); Boyle (2003b), Holmes and Adamowicz (2003); Tietenberg and Lewis (2012)

4.3.1 4.3.1 Revealed preference methods

4.3.1.1 Hedonic pricing

The hedonic pricing method is used to estimate the economic value of ecosystem goods and services that directly influence the price of another economic good (Daly & Farley 2011). The hedonic pricing method is appropriate for estimating the value of observable or known amenities and disamenities (Mendelsohn & Olmstead 2009). Hedonic pricing can be applied to any situation where the price of a good or factor of production is influenced by environmental factors, but the most common application of hedonic pricing is in the housing markets (Garrod & Willis 1999; Palmquist 1999; Taylor 2003).

The use of the hedonic pricing method requires the use of market data that can be disaggregated to determine the value of various components of the property, such as house characteristics, neighbourhood characteristics and environmental attributes (Tietenberg & Lewis 2012). The hedonic pricing method is used to estimate the influence of environmental attributes on the price of a housing unit. For example, the price of a house may be influenced by air and water quality or proximity to scenic beauty.

The hedonic wage approach involves disaggregating the components of a wage to determine how it is influenced by the characteristics of the individuals, the job, the location of the job (Taylor 2003) or risk associated with the job (Tietenberg & Lewis 2012). It is assumed that the proximity of job location to environmental amenities (Garrod & Willis 1999) or exposure to environmental risk (Tietenberg & Lewis 2012) influences an individual's decision to accept the wage associated with the job. Disaggregation of wage components will allow for the estimation of trade-offs between what workers are willing to earn in different situations (Taylor 2003).

4.3.1.2 Travel cost method

The travel cost method (TCM) is used to estimate the economic value of recreational uses of the environment (Chee 2004; Daly & Farley 2011; Parsons 2003). The TCM is based on the concept that the cost of travelling to a site is an important component of the full cost to visit a site and that, for any given site, there is usually a wide variation in travel cost across visitors to that site (Freeman III, Herriges & Kling 2003).

Rolfe & Dyack (2011) summarised the similarities and differences between the two basic variants of the TCM, namely the zonal travel cost model and individual travel cost model. In the zonal travel cost model, the dependent variable is the number of visits to a recreation site divided by total population within that site. In the individual travel cost model, the dependent variable is the number of visits made to a site by each recreational user over a specific period of time. The zonal travel cost model is appropriate for sites that have low individual visitation patterns, while the individual travel cost model is appropriate for sites with high individual visitation rates. Regardless of the specific model used, the application of TCM requires data on observed travel and time expenditures (Turner, Morse-Jones & Fisher 2010).

4.3.1.3 Avoidance expenditure

Avoidance cost estimates the economic values of nature based on the costs of avoided damage resulting from a lost ecosystem service (Daly & Farley 2011) or expenditures

incurred by taking avertive or defensive action to reduce the damage caused by the environmental problem (Tietenberg & Lewis 2012).

The avoidance expenditure technique is based on the notion that individuals will change their behaviour and incur expenditures to avoid the undesirable outcome associated with environmental problems (National Research Council 2005). When individuals incur private expenditure to avoid the damages caused by environmental problems (such as pollution), the sum of the costs incurred is at least a partial estimate of the value of these damages. One specific example is the cost of using bottled water if the groundwater source is contaminated (Mendelsohn & Olmstead 2009).

4.3.1.4 Replacement/restoration cost

The replacement or restoration cost technique estimates the value of change in an ecosystem service by calculating the cost of replacing the lost or reduced service with a man-made substitute or with restoration of the ecosystem (Turner, Morse-Jones & Fisher 2010). This valuation method is also used to estimate the cost of avoiding environmental damage (Barbier 2007).

4.3.2 Stated preference methods

4.3.2.1 Contingent valuation

The contingent valuation method (CVM) is the most widely applied survey-based method for welfare measurement for non-market goods and services (Bishop 2003; Kriström 1999). The method enables economic values to be estimated for a wide range of goods and services that are not traded in commercial markets (Hanley & Spash 1993). Contingent valuation is rooted in welfare economics, specifically in the neoclassical concept of economic value under the framework of individual utility maximisation (Hoyos & Mariel 2010).

The steps in conducting a contingent valuation study are extensively discussed by several authors (Boyle 2003a; Garrod & Willis 1999; Kriström 1999). Boyle (2003a) identifies ten steps which show the detailed activities involved in using the contingent valuation method. The 10 steps are: (i) identify the change(s) in quantity or quality to be valued; (ii) determine whose values are to be estimated; (iii) select a data collection mode; (iv) choose a sample size; (v) design the information component of the survey instrument; (vi) design the contingent valuation question; (vii) develop auxiliary questions for inclusion in the survey instrument; (viii) pretest and implement the survey;

(ix) develop data analysis procedures and conduct statistical analyses; and (x) report value estimates.

The CVM can be used to estimate all components of total economic value including non-use values (Hanley & Spash 1993; Ressurreição et al. 2011; Veisten 2007). Thus, the contingent valuation method resolves the problem of the absence of price for non-use values, as well as for option value (Plottu & Plottu 2007). Furthermore, CVM can be used to estimate the benefits of environmental changes (Hoyos & Mariel 2010), even the valuation of environmental changes that are yet to occur (Ressurreição et al. 2011).

4.3.2.2 Attribute-based methods: choice experiment, contingent ranking, contingent rating

Attribute-based methods of valuation are survey-based methods that ask respondents to choose from among hypothetical alternatives of bundles of environmental attributes, with each bundle of attributes having a corresponding price. The attribute-based methods do not directly reveal monetary valuation, but the values are derived from the choices or preferences (Freeman III, Herriges & Kling 2003). Attribute-based methods are appropriate in evaluating project options that have multiple levels of different attributes (Tietenberg & Lewis 2012). The commonly-used attribute-based methods of valuation are choice experiments, contingent ranking and contingent rating.

Holmes and Adamowicz (2003) outline the seven steps that are generally followed in using attribute-based methods: (i) characterise the decision problem; (ii) identify and describe the attributes; (iii) develop an experimental design; (iv) develop the questionnaire; (v) collect data; (vi) estimate the model; and (vii) interpret results for policy analysis or decision support.

Choice experiments involve asking respondents to choose their most preferred combination of attributes from the various combinations of options presented to them. Respondents are usually shown several choice sets, wherein each card shows a specific combination of attributes (Kuriyama 2000). Choice experiments are based on the notion that attributes of an environmental good can be used to understand the general trade-offs that an individual is willing to make (Hanley, Wright & Adamowicz 1998). This economic valuation method is useful in estimating the values of the attributes associated with development and mitigation activities (Kerr & Sharp 2008) and also when deciding on several conservation standards when each has a different combination of uses, benefits and associated costs (Garrod & Willis 1997).

In contingent ranking experiments, respondents are asked to rank a set of alternatives in order of preference rather than choosing the most preferred alternative (Kuriyama 2000). The alternatives in the choice set differ in the levels of these component attributes, and the cost which the respondent would incur as a result of the choice (Garrod & Willis 1997). The rankings are then compared to determine the implicit trade-offs between more of the environmental amenity and less of the other attributes. When one or more of these attributes can be expressed in terms of monetary value, it is possible to use this information and rankings to estimate the value to the environmental amenity (Freeman III, Herriges & Kling 2003; Tietenberg & Lewis 2012).

The last variant of attribute-based valuation methods is contingent rating. In this method, respondents are asked to rate a set of alternatives (e.g. on a scale of 1 to 5), with each alternative having a number of attributes and a corresponding price (Richardson & Loomis 2009). As with contingent ranking, contingent rating is useful in conjoint analysis of consumer preferences between complex alternatives (Mackenzie 1993). Contingent rating has been applied to the valuation of tourism attributes (Cuccia & Cellini 2007) and wood-based bio-energy production (Gruchy et al. 2012).

4.3.2.3 Contingent behaviour

The contingent behaviour method is used to estimate the value of the change in an individual's behaviour as a response to a change in an environmental amenity or price (Alriksson & Öberg 2008; Freeman III, Herriges & Kling 2003). Contingent behaviour is commonly used to assess the impact of quality or price changes at a recreational site (Grijalva et al. 2002).

The contingent behaviour method combines the revealed preference question on the number of trips taken to a site (rather than a willingness to pay) with the stated preference question on the likely change in the number of trips taken if a hypothetical change occurred at the site. The trip data is then used to model the willingness to pay for changes at the site. In the contingent behaviour model, the dependent variable is an integer for a before and after scenario indicating the number of trips to be taken to the site in a given time period (Barry, van Rensburg & Hynes 2011; Rolfe & Dyack 2011). For example, respondents may be asked how their pattern of trips to a site (or set of sites) would change if a proposed water quality change was implemented. The impact of water quality improvement is then estimated by combining observed data with contingent behaviour data (Jeon & Herriges 2010).

4.3.3 Minimising potential biases

The major concern with the CVM is the potential for survey respondents to give biased answers leading to either over or underestimation of the true economic value of the ecosystem goods and services to be valued. Value estimates in contingent valuation studies can be affected by hypothetical bias, anchoring bias, strategic bias, compliance bias, the embedding effect and warm glow effect (Chee 2004; Ressurreição et al. 2011; Tietenberg & Lewis 2012; van Exel et al. 2006).

Hypothetical bias is closely associated with the use of hypothetical scenarios or markets in contingent valuation studies. Respondents could give any amount that does not reflect their true valuation because they know that they are not actually going to pay anyway (Tietenberg & Lewis 2012; Whittington 2010) or because they do not have any experience relevant to the scenario (van Exel et al. 2006). On the other hand, Ajzen, Brown and Rosenthal (1996) note that valuation is influenced by the personal relevance of a public good.

Two strategies for reducing hypothetical bias and strategic bias that have been developed and tested in developing countries are “time to think” and drop-off protocols, both of which allow respondents to sleep on the contingent valuation question, giving them more time to ponder their willingness to pay answer (Whittington 2010). However, both approaches are costly and time-consuming because they require two visits to one respondent. More importantly, a recent study indicates that there is no evidence that the “time to think” approach actually reduces hypothetical bias and may, in fact, increase strategic bias (Cook et al. 2012). The drop-off protocol is similar to a self-administered questionnaire and not appropriate for illiterate respondents (Whittington 2010). One study that utilised the drop-off protocol subsequently utilised face-to-face interviews to gather all the required information (Labao et al. 2007).

Anchoring bias has two forms, namely starting point bias and ordering bias (van Exel et al. 2006). Starting-point bias may result when survey instruments use an elicitation format which asks respondent to choose an amount from a pre-defined range (Tietenberg & Lewis 2012). Ordering bias can result from the sequencing of questions or respondent fatigue (van Exel et al. 2006).

Strategic bias results when respondents intentionally give answers that do not reflect their true valuation, but which they believe could influence decision-making in their favour (Tietenberg & Lewis 2012; van Exel et al. 2006). For example, farmers who are asked about their willingness to pay higher irrigation fees may give lower values if they believe that their response will influence the decision to increase fees.

Compliance bias is when a respondent gives an answer which he or she thinks would please the interviewer (Chee 2004; Ressurreição et al. 2011). The respondents' answer can be influenced by their perception on the role of the interviewer about how the results may be used in decision-making (Whittington 2010).

The embedding effect or part-whole bias occurs when respondents give the same valuation for a portion of the ecosystem goods or service as for the whole resource (Chee 2004; Ressurreição et al. 2011), or when respondents state values for the entire environment rather than the specific area of the environment (Hadker et al. 1997). This happens when respondents are not able to distinguish between smaller and larger quantities, risks or probabilities (van Exel et al. 2006).

The warm glow effect is characterised by a respondents' general approval of a socially acceptable initiative by giving the value which indicates their assumed attitude and not their actual intention to pay (van Exel et al. 2006). This can lead to the overestimation of true value (Grammatikopoulou & Olsen 2013).

For this research, during the survey design and implementation, particular attention was given to minimising potential anchoring bias, strategic bias, compliance bias, the embedding effect and the warm glow effect. The academic character of the research and its independence from government policy were highlighted. Respondents were asked at the beginning of the interview to answer all questions truthfully.

4.4 Reasons for and implementation of contingent valuation

4.4.1 Reasons for choice of contingent valuation

Contingent valuation is the most appropriate valuation method for this research because the study aimed to estimate the value of three single ecosystem goods and services (watershed protection, nature-based tourism, and biodiversity conservation). Garrod and Willis (1997) notes that the CVM, which uses open-ended or dichotomous choice valuation questions, is most effective for valuing a single well-specified and defined conservation good that can either be accepted or rejected. Bishop (2003) also suggested that the CVM is the appropriate valuation technique in situations when: (i) there is not enough revealed preference data; (ii) there are no revealed preference data at all; or (iii) it is necessary to extrapolate beyond the data range.

A review of previous studies showed the flexibility of using the contingent valuation method in estimating the economic values of a wide range of ecosystem goods and services in different parts of the world. The CVM has been applied in the estimation of

both TEV and in the estimation of the different components of TEV. For the estimation of TEV, the CVM was applied in a coastal area in Canada (Gunton & Joseph 2010), an impaired river basin in the US (Loomis 2000), and in an impaired ecosystem in China (Zhongmin et al. 2003).

Recreation is one direct use component of total economic value where the CVM has been extensively applied, from northern Europe to Australia (Bennett, Tranter & Blaney 2003; Ellingson & Seidl 2007; Greiner & Rolfe 2004; Hakim, Subanti & Tambunan 2011; Lee & Mjelde 2007; Nunes 2002; Reynisdottir, Song & Agrusa 2008). For ecosystem goods and services that represent the indirect use component of the TEV, the CVM has been applied in the various aspects related to watershed protection and water supply (Moreno-Sanchez et al. 2012; Ojeda, Mayer & Solomon 2008; Raje, Dhobe & Deshpande 2002; Van Hecken, Bastiaensen & Vásquez 2012; Vásquez et al. 2009; Whittington 1998). The application of the CVM on the non-use component of TEV has been mainly related to estimations of the economic value of biodiversity conservation (Jacobsen & Hanley 2009; Loomis & White 1996; Moran 1994; Ressurreição et al. 2011; Spash & Hanley 1995; Surendran & Sekar 2010).

This study deals with all three situations identified by Bishop (2003). For climbing, there is not enough revealed preference data, and there is no revealed preference data at all for watershed protection and biodiversity conservation. Moreover, as contingent valuation estimates are used as inputs to a PES design, it is necessary to extrapolate beyond the range of the data. Recent contingent valuation studies conducted in Nicaragua (Van Hecken, Bastiaensen & Vásquez 2012) and Colombia (Moreno-Sanchez et al. 2012) demonstrate how results of contingent valuation studies related to watershed protection and services can be used as inputs in PES design.

4.4.2 Key elements of contingent survey instrument

Designing a survey instrument is one of the critical components of a contingent study. A contingent survey instrument has three key components: (1) information component, (2) contingent valuation questions, and (3) debriefing and auxiliary questions (Boyle 2003a; Carson & Louviere 2011; Whittington & Pagiola 2012)

The information component includes a description of ecosystem goods and services to be valued, as well as management plans. For a contingent valuation study intended to inform potential PES design, it is not uncommon to simply ask respondents about their willingness to pay for specific ecosystem goods or services without providing any information about the management plan. The results of such studies remain useful provided that respondents were not told of any other means to obtain the ecosystem

goods and services (Whittington & Pagiola 2012). For this research, the contingent valuation instrument was preceded by a contingent valuation scenario with brief description of the ecosystem services to be valued (Appendix 7).

Contingent valuation questions are designed to elicit the willingness to pay amount and include elicitation format and mechanism for payment. Some of the common forms of eliciting the willingness to pay amount for ecosystem goods and services are dichotomous-choice bids (single-bound or double-bound), open-ended bids and payment cards (Bateman et al. 2001; Becker & Freeman 2009; De Faria et al. 2007; Langford et al. 1998; O'Conor, Johannession & Johansson 1999; Ryan & Watson 2009; Watson & Ryan 2007; Zhongmin et al. 2003). Depending on the nature of ecosystem goods and services, possible forms of payment include: (1) one-time lump sum payment; (2) continuing payment over a specified period of time (e.g., monthly or annual) or possibly indefinitely; and (3) payment at time of use (Carson & Louviere 2011).

The dependent variable in a contingent valuation study can vary depending on the willingness to pay elicitation format used. For dichotomous-choice elicitation formats, the dependent variable is the willingness to pay choice (Yes or No). For open-ended bids and payment cards, the dependent variable is the stated willingness to pay amount.

Auxiliary questions are intended to help explain differences in responses and gauge construct validity (Carson & Louviere 2011). Among important auxiliary questions are those intended to gather information about demographic characteristics of respondents and knowledge about, or use, of ecosystem goods and services under consideration, as well as attitudinal questions related to the ecosystem goods and services. Thus, auxiliary questions are designed to gather independent or explanatory variables.

Debriefing questions are designed to help gauge respondents' motivation or certainty about responses in the willingness to pay question. A common example of a debriefing question is one intended to identify protest zeros (Awad 2012; Carson & Louviere 2011; Whittington & Pagiola 2012). Inclusion of debriefing questions is believed to contribute to refining willingness to pay estimates in contingent valuation studies (Hite, Hudson & Intarapapong 2002).

4.4.3 Structure of the questionnaires

4.4.3.1 Contingent valuation questions

Three sets of contingent valuation survey instruments were developed for three groups of respondents: the general public, tourists and household water users. The contingent valuation instruments were designed to elicit willingness to pay for watershed protection, climbing Mount Apo and biodiversity conservation in the MANP. Table 4-4 summarises the valuation of ecosystem services sought from each group of respondents.

Table 4-4: Respondent group by ecosystem service being valued, Mount Apo Natural Park, Mindanao, the Philippines

Respondent group	Ecosystem service		
	Watershed protection	Climbing Mount Apo	Biodiversity conservation
General public	✓	✓	✓
Household water users	✓	×	×
Mountain climbers	×	✓	×

Table 4-5 shows the form of payment sought from each group of respondents for the ecosystem goods and services addressed by this research. The prospect of a one-off payment for watershed protection was presented to the general public and household water users in order to estimate the option value for watershed protection. A monthly payment for watershed protection was asked of household water users since the payment vehicle is a monthly water bill. For climbing, the willingness to pay amount per climb per person was sought from general public respondents and climber respondents, as that is the existing form of payment. An annual payment for biodiversity conservation was sought from general public respondents because a similar payment scheme is used in other contingent valuation studies for biodiversity conservation (Surendran & Sekar 2010).

4.4.3.2 Elicitation of explanatory variables

The first and last sections of all survey instruments contained similar questions. The first section of all survey instruments was intended to gather socio-demographic information about respondents. The last section of the survey instruments required

respondents to rate the importance to them of uses and benefits of the MANP. The other parts of the contingent valuation instruments varied according to the ecosystem service being valued.

Table 4-5: Form of payment asked of each respondent group, by ecosystem service being valued

	Ecosystem service		
Respondent group	Watershed protection	Climbing to Mount Apo	Biodiversity conservation
General public	One-off payment per person	Per climb per person	Annual payment per person
Household water users	One-off payment per household Monthly payment per household	n/a	n/a
Mountain climbers	n/a	Per climb per person	n/a

n/a - not applicable

4.4.4 The questionnaires in detail

4.4.4.1 Questionnaire for members of the general public

In the context of this research, members of the general public were non-user but could be potential users of ecosystem services provided by MANP. The questionnaire for the general public was intended to elicit the respondents' willingness to pay for watershed protection, climbing Mount Apo and biodiversity conservation (Appendix 8). The instrument was divided into two parts and questions related to the elicitation of willingness to pay were in the second part of the instrument. The willingness to pay elicitation question for each ecosystem service was preceded by questions related to the possible use or awareness of the ecosystem services. Those questions were intended to provide the context for the willingness to pay elicitation question. Willingness to pay date were utilized in the estimation of option values of water provision for domestic use and climbing, and estimation of non-use value of biodiversity conservation

4.4.4.2 Survey instrument for the household water users

This research considered household water users as direct users of water provision services of MANP. The survey instrument administered to household water users was intended to elicit the willingness to pay for watershed protection only and was divided into three parts (Appendix 9). The second part included questions related to the household's water use, supply from the local water district and perceptions on physical attributes and safety of water for various uses. The willingness to pay questions were contained in the last part of the instrument. All the questions preceding the willingness to pay question contributed to the scenario that provided the context for the contingent valuation. Data gathered from household water users were utilised in estimating the use values of water provision for domestic use.

4.4.4.3 Survey instrument for tourists

As recreation in the MANP protected area principally involves climbing Mt Apo, the tourists interviewed for this research were climbers. They are direct users of recreation services provided by MANP. The survey instrument for mountain climbers was intended to elicit willingness to pay recreation use values and was divided into two parts (Appendix 10). The willingness to pay elicitation questions were in the second part. The contingent valuation question was preceded by questions associated with the trip, including travel expenses, duration of the trip, motivations, previous trips to Mount Apo and possible alternative activities. The questions built the scenario for the contingent valuation question. Willingness to pay data gathered from climbers were utilised in the estimation of use value for climbing.

4.4.4.4 Contingent valuation elicitation format and bid amounts

A single-bounded dichotomous choice bid format was followed by an open-ended question that asked the maximum willingness to pay amount. The advantage of a single-bound dichotomous choice question is that each respondent is asked a single valuation question that is relatively easy to answer (Whitehead 2006) and closely approximates market transactions or referenda familiar to respondents (Moran 1994; van Exel et al. 2006). Thus, the single-bound dichotomous-choice format reduces the chance that respondents may be annoyed by repeated questioning, which poses a danger that respondents may give an answer that does not represent their true preference so as to complete the interview as quickly as possible (Ojeda, Mayer & Solomon 2008). The single-bound dichotomous-choice elicitation format minimises the chance of obtaining valuation estimates that were influenced by compliance or ordering bias.

A disadvantage of the single-bound dichotomous-choice format is that the data obtained only indicates whether the respondent's willingness to pay is above or below the bid amount (Whitehead 2006). Such a disadvantage was addressed by the open-ended follow-up question that asked respondents their maximum willingness to pay amount.

Each respondent was asked a follow-up open-ended question to elicit the maximum amount that they would be willing to pay, regardless of their response to the dichotomous-choice question. The answer to this question was sought regardless of the answer in the dichotomous-choice question. See Box 4-1 for the sample willingness to pay elicitation questions.

The bid amounts are summarised in Table 4-6. Two contingent valuation amounts were asked for watershed protection: (i) one-off payment (from the general public and household water users) and (ii) monthly payment on top of the monthly water bill (household water users only). The minimum monthly water rate at the time of the survey (PhP104 =AUD 2.45)[9] was utilised as a reference value for the bid amounts for watershed protection. The smallest bid amount for a one-off payment was PhP P100 (AUD 2.35) and smallest bid amount for a monthly payment was PhP 25 (AUD 0.59). The highest bid amounts for watershed protection were set at 10 times the smallest bid amount.

For climbing, the official fee for a local climber (Filipino citizen) at the time of the survey was PhP 500 (AUD 11.76). The smallest bid amount for climbing was set at double the climbing fee. For biodiversity conservation, the smallest bid amount was the same as the existing climbing fee. No reference values for biodiversity were available so the same range and distribution of bid amounts for climbing was used. Incidentally, the lowest bid amount for climbing and biodiversity conservation was 10 times the entrance fee to the Philippine Eagle Center in Davao City[10]. The highest bid amounts for climbing and biodiversity conservation were 5.5 times the minimum amount.

[9] The lowest monthly water bill at the time of the survey was PhP104 (AUD 2.45), which was levied by the water utility in Davao City. Different areas were served by different water utilities that charged different water rates

[10] The only place in Mindanao that keeps and exhibits a specimen of the critically endangered Philippine eagle, *Pithecophaga jefferyi*.

Box 4-1: Willingness to pay elicitation questions for each of the surveys

Note: Amount shown is the lowest bid amount for each of the questions

A1. Watershed protection, recurring monthly payment:

Q21. Are you willing to pay PhP 25 per month in addition to your water bill to protect the water sources at Mt. Apo Natural Park?

☐ Yes……☐ No

Q22. What is the maximum amount you are willing to pay per month, in addition to your water bill, to protect the water sources at Mt. Apo?

_____Pesos per month

A2. Watershed protection, one-off payment:

Q23. Are you willing to make one-off payment of PhP 100 to protect water sources at the MANP?

☐ Yes……☐ No

Q24. What is the maximum one-off payment you are willing to make to protect water sources at the MANP?

_____PhP

B. Climbing:

Q17. Are you willing to pay PhP 1000 climb fee per person for each visit/climb to Mt. Apo?

☐ Yes……☐ No

Q18. What is the maximum amount you are willing to pay for climb fee per person for each visit?

_____PhP per visit

B. Biodiversity conservation:

Q15. Are you willing to pay PhP 500/year for the conservation of rare plants and animals at Mt. Apo?

☐ Yes……☐ No

Q16. What is the maximum amount you are willing to pay per year for the conservation of rare plants and animals at Mt. Apo?

_____PhP

Table 4-6: Summary of bid amounts in the dichotomous bid question

(in Philippine Peso, PhP)

Watershed protection		Climbing Mount Apo	Biodiversity conservation
One-off payment	Monthly payment		
100	25	1000	1000
200	50	1500	1500
300	75	2000	2000
400	100	2500	2500
500	125	3000	3000
600	150	3500	3500
700	175	4000	4000
800	200	4500	4500
900	225	5000	5000
1000	250	5500	5500

1 PhP = A$0.0237 (1A$ = PhP42.50), 30 January 2013.

4.5 Survey implementation

4.5.1 Pre-testing

The draft contingent valuation questionnaires went through two stages of pre-testing. The first stage of pre-testing was conducted on 15 March 2010 among 15 Filipino students from Mindanao who were studying at Charles Darwin University at the time. The pre-testing was followed by discussions on the design and content of the survey instruments with pre-test respondents. The second pre-testing was conducted in various places around the MANP from the last week of March 2010 until the middle of May 2010. Table 4-7 shows the detailed schedule of pre-testing of the questionnaires for the three respondent groups.

Table 4-7: Schedule of in-field pre-testing of survey instruments for the different respondent groups

Respondent group	Place of pre-test surveys	Number of pre-test respondents	Date of pre-test
Climbers	Kapatagan (Digos City)	15	30-31 March 2010
Water users	Davao City	25	10-13 April 2010
Water users	Makilala, North Cotabato	15	16-17 April 2010
General public	Davao City	25	2-4 May 2010
General public	Digos City	15	06 May 2010
General public	Bansalan, Davao del Sur	10	08 May 2010

4.5.2 Respondent groups and sampling

The target population for the survey was composed of three groups:

(1) Members of the general public in the four municipalities and three cities that include the MANP;

(2) Household water users in the four municipalities and three cities that include the MANP whose monthly water bill is based on actual water consumption; and

(3) Climbers of Mount Apo who use any of the official trekking trails located in the four municipalities and two cities that cover the MANP.

Two-stage sampling was used to determine the number of respondents. Probability sampling was utilised in the first stage to determine the number of respondents for each group. The second stage involved using stratified random sampling to determine the sample for each administrative area and entry point for climbing. In probability sampling, precision is affected by the size of the sample and not the proportion of the population sampled (Dillman, Smyth & Christian 2009). Sample size was decided through the following formula:

$$Ns = \frac{(N_p)(p)(1-p)}{(N_p-1)(B/C)^2+(p)(1-p)} \qquad \text{(Eq. 1)}$$

where N_s is the completed sample size needed for the desired level of precision; N_p is the size of the population; p is the proportion of the population expected to choose one of two response categories; B is the margin of error (that is, one half of the desired confidence interval width); and C is the Z-score associated with the confidence interval (Dillman, Smyth & Christian 2009, p. 56).

The last census conducted in the Philippines was in 2007 and it showed a total population of about 1.9 million people in the administrative areas that include the MANP. Using the census population data, together with 95% confidence interval (5% margin of error) and a 50/50 chance that respondents would answer either Yes or No in the dichotomous-bid contingent valuation question, resulted in a target sample size of 384 for each group of respondents. However, the minimum number of respondents was set at 400 so that each of the 10 bid amounts would have a minimum of 40 respondents. Whitehead (2006) suggests that when a dichotomous bid format is used in contingent valuation, a minimum of 30 respondents for each bid amount is needed to obtain reliable statistical results.

The total population was used as a basis for stratification of the sample. Table 4-8 shows the population distribution in the administrative areas that include the MANP. For the general public and the household water user respondents, stratification was based on the population in the respective administrative area. For climber respondents, stratification was based on historical data on the number of climbers at different official entry points for climbing Mount Apo.

Table 4-8: Population distribution in the administrative areas that include the Mount Apo Natural Park, Mindanao, the Philippines

Administrative area (municipality/city)	Total population	Percent of total population
Magpet	44,114	2.36
Makilala	71,543	3.82
Bansalan	54,246	2.9
Sta Cruz	76,113	4.06
Davao City	1,363,337	72.81
Digos City	145,514	7.77
Kidapawan City	117,610	6.28
Total	1,872,477	100.00

Source: National Statistics Office (www.censu.gov.ph)

4.5.3 Conduct of survey

The surveys were conducted through face-to-face interviews from April 2010 to October 2010. Face-to-face interviews give a higher response rate (Hadker et al. 1997) than other survey methods because they do not exclude probable respondents with a reading disability (Carson, Flores & Meade 2001). The interaction between the interviewer and the interviewee provides greater control about the conduct of the survey (Carson, Flores & Meade 2001; Hadker et al. 1997) and facilitates immediate data verification.

In the Philippine context, several factors contribute to the practically of conducting surveys through face-to-face interviews. There is no existing database that can be utilised in identifying potential respondents. Another factor is that not all areas have access to telecommunication facilities, which will likely exclude important segments of the population if telephone interviews or mail surveys are used.

The survey of tourists was conducted during the climbing seasons of April-May and October, while the surveys of the general public and household water users were conducted from June to September 2010. Survey implementation was assisted by enumerators who were either college graduates of the University of the Philippines Mindanao with prior experiences conducting surveys, or had been employed by the National Statistics Office to conduct surveys. Enumerators included six graduates of agribusiness economics, three graduates of commerce and marketing and one graduate of forestry. Enumerators were provided with the background of the research and were trained in the conduct of the survey. There were regular feedback sessions after the completion of 15-20 interviews.

The interviews were preceded by a plain English language statement about the research. When necessary, the English statement was explained in the local dialect. It was emphasised that the research was not commissioned by any government agency, nor was it part of any existing plan to increase fees for climbing or water usage or to collect fees for biodiversity conservation. The interviews were conducted after respondents had given their consent by signing consent forms.

A major consideration in the conduct of the interviews was a setting that would allow respondents to think about their responses (Hanemann 1994). The place and timing of the surveys varied depending on the type of respondent. Table 4-9 shows the locality and timing of interviews for the different groups of respondents. Climber respondents

were interviewed at local tourism offices after completing all the requirements for climbing, water user respondents were interviewed in their houses and general public respondents were interviewed in public areas.

Table 4-9: Locality and usual timing of interview, by respondent group

Respondent group	Actual place of interview	Usual timing of interview
General public	Market Rest area in shopping malls	10-11am and 2-3pm any day of the week, when prospective respondents were just sitting and relaxing
	Public transport terminals	Noontime and 4-5pm any day of the week, when prospective respondents were waiting for buses or jeepneys
	Public parks	4-6pm on Fridays and weekends, when prospective respondents were just sitting and relaxing
Tourists	Local tourism office	Early or late morning during the April-May and October climbing seasons, after the tourists had completed all the requirements and were waiting for the transportation to the jump-off area
Household water users	Home	Mid morning or mid afternoon, when the head of household was relaxed from household duties

The number of respondents, by type and place of survey, is shown in **Error! Reference source not found.**. The actual distribution of the general public and water user respondents did not strictly follow the population distribution in the different administrative areas. It was necessary to adjust the number of respondents for each administrative area to avoid obtaining a highly skewed sampling distribution which could impact the validity of results. The actual distribution of respondents ensured sufficient geographic representation for each bid amount and for each group of respondents to enable locality comparisons.

Table 4-10: Number of respondents, by respondent group and place of survey

Administrative area	General public			Water users			Climbers		
	Frequency	Percent Distribution	Response rate	Frequency	Percent Distribution	Response rate	Frequency	Percent Distribution	Response rate
Magpet	50	7.7%	80.6%	52	8.2%	91.2%	78	18.1%	98.7%
Makilala	50	7.7%	86.2%	50	7.8%	96.2%	61	14.2%	100.0%
Bansalan	50	7.7%	83.3%	50	7.8%	96.2%	73	16.9%	98.6%
Sta Cruz	50	7.7%	83.3%	50	7.8%	92.6%	30	7.0%	93.8%
Davao City	308	47.7%	91.1%	310	48.6%	92.5%	0	0.0%	n/a
Digos City	78	12.1%	83.9%	66	10.3%	86.8%	66	15.3%	93.0%
Kidapawan City	60	9.3%	88.2%	60	9.4%	85.7%	123	28.5%	69.7%
Total	**646**	**100.0%**	**87.4%**	**638**	**100.0%**	**91.7%**	**431**	**100.0%**	**95.8%**

n/a = not applicable

4.6 Data analysis

4.6.1 Data verification and coding

Data verification was undertaken during the period of the survey, and immediate data verification proved to be a major advantage of face-to-face interviews. The data were coded according to the sequence of the questions in the survey instruments and were summarised in Microsoft Excel® format. The raw data are kept in Microsoft Excel® format. Table 4-11 to 4-15 give details about the variables.

Table 4-11: Type and unit of measurement of socio-demographic variables

Variable	Type	Unit of measurement
Place of residence	Category	1=Magpet…5=Davao City… 8=others
Gender	Dichotomous	0=male; 1 = female
Age	Category	1=15yrs old and below... 4=36-45 yrs old... 8=66yrs and older
Highest level of education	Category	1=no formal education... 5=high school graduate... 8=post graduate
Occupation	Category	1=top executive... 5=service worker… 9=laborer
Monthly income before taxes (range)[1/]	Category	1=below PhP3,333... 6=PhP10,333-PhP13,332... 12=PhP25,833 and above
Number of household members	Continuous	Person
Number of children in the household	Continuous	Children

[1/] Monthly personal income for general public and climber respondents; monthly household income for water user respondents

Table 4-12: Type and unit of measurement of variables for watershed protection, Mount Apo Natural Park, Mindanao, the Philippines

Variable	Type	Unit
Problem with continuity of water supply	Dichotomous	0=no; 1=yes
Average monthly household water consumption	Continuous	Cubic meter
Water bill in the previous month	Continuous	PhP
Lowest water bill in the past 12 months	Continuous	PhP
Highest water bill in the past 12 months	Continuous	PhP
Level of agreement with 'perception' statements about water quality 'Water is clear' 'Water tastes good' 'There may be bacteria in the water' 'There may be traces of heavy metal in the water' 'There may be traces of chemicals in the water'	5-point scale	1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree
Level of agreement with 'perception' statements about water safety 'Water is safe for drinking' 'Water is safe for cooking' 'Water is safe for bathing' 'Water is safe for washing'	5-point scale	1=very unsafe; 2=unsafe; 3=neither safe nor unsafe; 4=safe; 5=very safe
Household has other source of water	Dichotomous	0=no; 1=yes
Aware that Mount Apo is source of water for water district	Dichotomous	0=no; 1=yes
Aware that Mount Apo is a water catchment area	Dichotomous	0=no; 1=yes
CV questions		
Are you willing to pay PhPxxx per month in addition to water bill to protect water sources in Mount Apo?	Dichotomous	0=no; 1=yes
What is the maximum amount you are willing to pay per month, in addition to water bill, to protect water sources in Mount Apo?	Continuous	PhP
Are you willing to make one-off payment of PhPxxx to protect water sources in Mount Apo?	Dichotomous	0=no; 1=yes
What is the maximum amount of one-off payment are you willing to make to protect water sources in Mount Apo?	Continuous	PhP

Table 4-13: Type and unit of measurement of variables for climbing, Mount Apo Natural Park, Mindanao, the Philippines

Variable	Type	Unit of measurement
Mode of transport	Category	1=public transport... 3=combination
Days away from home for the trip	Continuous	Day
Days intend to stay at Mount Apo	Continuous	Day
Number of people in the travelling group	Continuous	Person
Type of travel group	Category	1=family... 3=family and friends... 5=organised group
Motivation for the trip provided by climbing Mount Apo	5-point scale	1=not a motivation at all... 5=only reason for the trip
Expenses for the trip	Continuous	PhP
Items: Entrance fee		
Transportation		
Food		
Accommodation		
Travel guide		
Others		
Total expenses		
Other activities if not climbing Mount Apo	5-point scale	1=highly unlikely; 2=unlikely; 3=neither likely nor unlikely; 4=likely; 5=highly likely
Work		
Attend school		
Stay at home		
Visit other tourist site/destination		
Number of previous visits/climbs to Mount Apo	Continuous	Frequency
Will come back in the future	Category	0=no; 1=not sure; 2=yes
Level of agreement with 'motivation'	5-point scale	1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree
'I like being outdoors'		
'I like climbing mountains'		
'I just want to climb Mount Apo'		
'Mount Apo is the highest mountain in the Philippines'		
'Mount Apo is a sacred place'		
Philippine eagle or other rare plants and animals'		
'I enjoy sharing a nature experience with family and friends'		
CV questions		
Are you willing to pay PhPxxx climb fee per person for each visit/climb to Mount Apo?	Dichotomous	0=no; 1=yes
What is the maximum amount you are willing to pay for climb fee per person for each visit?	Continuous	PhP

Table 4-14: Type and unit of measurement of variables for biodiversity conservation, Mount Apo Natural Park, Mindanao, the Philippines

Variable	Type	Unit of measurement
Aware that Mount Apo is home to some rare plants and animals	Dichotomous	0=no; 1=yes
CV questions		
Are you willing to pay PhPxxx per year for the conservation of rare plants and animamls in Mount Apo?	Dichotomous	0=no; 1=yes
What is the maximum amount you are willing to pay per year for the conservation of rare plants and animamls in Mount Apo?	Continuous	PhP

Table 4-15: Type and unit of measurement of protest bids and values of the Mount Apo Natural Park, Mindanao, the Philippines

Variable	Type	Unit of measurement
Level of agreement with "reasons" for protest bid 'We are already paying too much for water bill' 'I do not believe that improved watershed management will ensure reliable water supply' 'I think it is the government's responsibility to finance watershed protection' 'I think it is the government's responsibility to finance the conservation of rare plants and animals' 'I do not trust the organisation that will manage the funds' 'Only the rich people should pay'	5-point scale	1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree
Importance attached to various uses of MANP 'People are able to climb Mount Apo' 'People can safely drink water that comes from Mount Apo catchment areas' 'People can see the Philippine eagle or other rare plants and animals on Mount Apo' 'The Philippine eagle or other rare plants and animals live in Mount Apo' 'People are living on the footslopes of Mount Apo' 'Food crops are being grown on the footslopes of Mount Apo'	5-point scale	1=highly unimportant; 2=unimportant; 3=neither important nor unimportant; 4=important; 5=highly important

4.6.2 Statistical data analysis

Demographic data were subjected to statistical analysis to determine if significant differences exist among respondent groups. Analysis of variance (ANOVA) was performed to determine the significance of differences among respondent groups in terms of age and educational attainment. A post-hoc test was conducted to determine the extent of differences between and among groups (Gravetter & Wallnau 2007). The Games-Howell post-hoc test was used because of unequal sample sizes and sample variances among respondent groups (Allen & Bennett 2010). Pearson's two-tailed chi-square test was conducted to determine if consumption of bottled water was correlated with number of children in the household. The Statistical Package for the Social Sciences (SPSS®) was used for the statistical analysis.

4.6.3 Econometric analysis: estimation of willingness to pay and consumer surplus

Welfare estimates from dichotomous-choice bids were calculated using logit regression, while welfare estimates from open-ended bids were calculated using Tobit regression. NLogit® software (Econometric Software Inc.) was used to estimate the models.

4.6.3.1 Logit models to analyse acceptance of dichotomous bids

The logit model (also referred to as the conditional logit model) is a popular model for examining discrete choice outcomes. According to Buckland et al. (1999), logistic regression is the natural way to analyse dichotomous choice data. The model is derived from the random utility maximisation structure (Grafton et al. 2004). A logit equation relating the probability of "yes" answers to each suggested amount must be estimated when a closed-ended referendum approach was used (Hanley & Spash 1993).

Logistic regression was utilised for the dichotomous-choice yes/no willingness to pay data to determine the factors that influenced the respondents' willingness to accept a bid and the likelihood of influence of each factor. Since covariates[11] were present, the

[11] Explanatory variable

logistic regression equation was:

$$E(y_i) = \frac{\exp(\beta_0 + \sum_i \beta_i x_i)}{1+\exp(\beta_0 + \sum_i \beta_i x_i)} = \frac{1}{1+\exp(-\beta_0 - \sum_i \beta_i x_i)} \quad \text{(Eq. 2)}$$

where $E(y_i)$ is the probability that a respondent accepts the bid; x_{ij} is the value of covariate i for respondent j, $i \geq 1$, x_{1j} is the bid offered to respondent j and β_i were the coefficients estimated, where $i \geq 0$.

An alternative way of presenting the basic relationships in the logit model is:

$$\text{Probability (Yes)} = 1 - [1+\exp[\beta_0 - \beta_1(\$X)]]^{-1} \quad \text{(Eq.3)}$$

where *β's* are coefficients of the explanatory variables and $X is the amount that the respondents were asked to pay. Examples of the application of the above relationship were in their estimation of the total economic value of restoring the ecosystem system in an impaired river basin Loomis et al. (2000) and in the estimation of the willingness to pay for the conservation of the Philippine eagle (Labao et al. 2007).

4.6.3.2 Estimation of willingness to pay amount from dichotomous-choice bids

Equation 3 is the basis for Hanemann's (1989) formula for calculating the expected value of willingness to pay if willingness to pay must be greater than or equal to zero. The formula, as expanded by Labao et al. (2007) shows that:

$$\text{Mean WTP} = (1/\beta_1) \bullet \ln(1 + \exp(\beta_0 + \sum \beta_i X_i)) \quad \text{(Eq.4)}$$

where β_1 is the coefficient estimate of the bid amount, β_0 is the estimated constant and $\sum \beta_i X_i$ is the product of the estimates of the other independent variables and their respective means.

The 95% confidence interval of willingness to pay for each ecosystem service was estimated using the bootstrapping features of NLogit. Unlike the delta method of estimating confidence intervals, bootstrapping does not require the willingness to pay to be symmetrically distributed nor that the coefficients be normally distributed (Hole 2007). Confidence intervals are necessary because point estimates of average or mean benefits may not provide sufficient information for decision making (English 2000). The estimates of confidence intervals from dichotomous choice contingent valuation surveys are necessary for statistical comparison of estimates (Cooper 1994; Park, Loomis & Creel 1991).

4.6.3.3 Tobit models for analysis of open-ended bids and estimation of willingness to pay amount

Tobit regression was used to analyse the data from open-ended contingent valuation question which asked respondents for their maximum willingness to pay. The Tobit model is more appropriate than ordinary least squares when there is censoring in the dependent variable (Storm, Heckelei & Heidecke 2011). For this research, the minimum value of the dependent variable, which is the willingness to pay, is zero for either watershed protection or biodiversity conservation. The minimum value for climbing is censored at PhP 500, which was the official climbing fee at the time of the survey. Following Storm, Heckelei and Heidecke (2011), the general Tobit model with censoring limit is represented by:

$$y_i^* = x_i' \beta + \epsilon_i , \quad i = 1,2,\dots,N \qquad \text{(Eq. 5)}$$

$$y_i = y_i^* \ \ if\ y_i^* > c \ ; \quad y_i = c \ \ if\ y_i^* \leq c$$

where y_i^* and y_i are the latent and observed variables of willingness to pay, respectively, c is the censoring limit, β is a $(Kx1)$ vector of unknown coefficients, ϵ_i is the error terms and x_i is row vector of a set of K observed explanatory variables of observation i. All open-ended bids, including protest bids are included in the Tobit models.

4.6.3.4 Estimates of consumer surplus

Consumer surplus represents the value of the ecosystem service to an individual, which is monetised by the net willingness to pay (Loomis et al. 2000); it is the area under the demand curve but above the cost incurred for utilising the ecosystem service (Greiner & Rolfe 2004; Lipton et al. 1995). Figure 4-1 illustrates the concept of consumer surplus for water provision, mountain climbing, and biodiversity conservation.

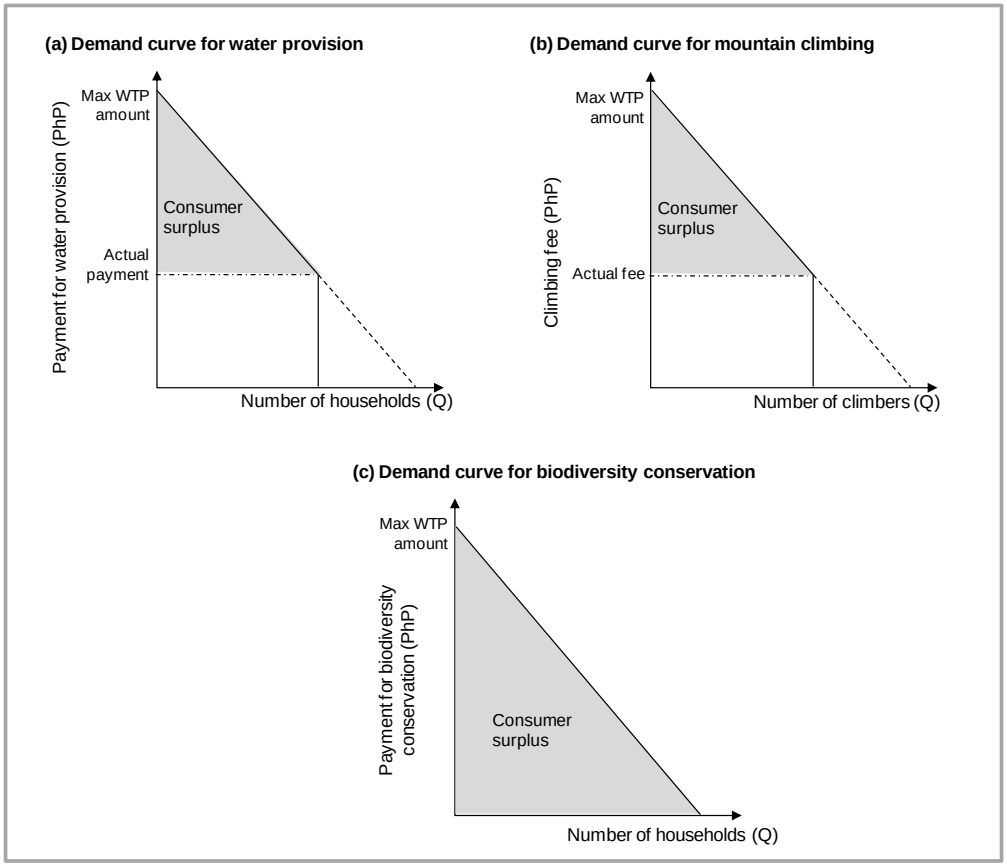

Figure 4-1: Conceptualisation of ecosystem services demand curves and consumer surplus

For watershed provision, the consumer surplus is estimated as the mean monthly willingness to pay amount for watershed protection less the portion of the average monthly water bill attributed to watershed protection. For climbing, the consumer surplus is the mean willingness to pay amount less the average climbing fee paid by each climber. For biodiversity conservation, the consumer surplus equals the mean willingness to pay amount because no payment is currently being made for biodiversity.

4.7 Components and estimate of total economic value of the Mount Apo Natural Park

Figure 4-2 shows components of TEV of the MANP that are the focus of this research: use values associated with domestic water provision and climbing, option and use values of watershed protection, option value of climbing and non-use (bequest and/or existence) of biodiversity.

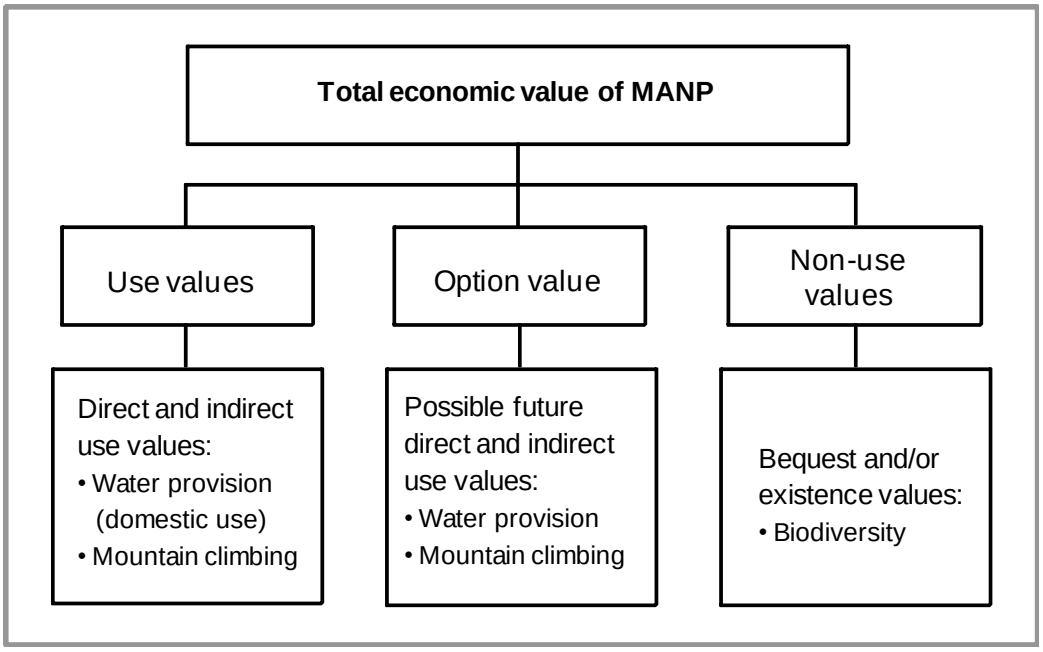

Figure 4-2: Elements of total economic value of the Mount Apo Natural Park captured by this research

The TEV of the MANP was estimated by utilising the consumer surplus derived from willingness to pay estimates derived from open-ended bids for watershed protection, climbing and biodiversity conservation. Other variables that were utilised in the estimation of TEV were population date, interest rate and discount rate.

5 Respondent profiles, resource utilisation and values attributed to the Mount Apo Natural Park

This chapter describes the research respondents and is divided into three sections. Section 5.1 provides a socio-demographic profile. Section 5.2 shows respondents' resource utilisation, perceptions and awareness about the different attributes of the MANP. Section 5.3 presents the values attributed by respondent subsamples to the various ecosystem services provided by the MANP.

5.1 Socio-demographic profile of respondents in subsamples

5.1.1 General public respondents

There were 646 respondents in the general public subsample. The socio-demographic profile is summarised in Table 5-1. Residents of Davao City comprised the biggest group (44.0%), followed by residents of Digos City (11.6%). Residents of administrative areas outside MANP accounted for 3.6% of all respondents. There were slightly more female respondents than males.

General public respondents were generally young; one-third being in the 16-25 years age group. They were generally well educated; about 32% had a baccalaureate degree, more than a quarter had at least some college education, and 6.3% had postgraduate education. More than one-third of respondents had a personal income below PhP 3,333 per month (AUD 77),[12] while 6.4% earned more than PhP 20,833 per month (AUD 483).

5.1.2 Household water user respondents

This subsample comprised 638 household water user respondents. Table 5-2 summarises their socio-demographic profile. The largest group of respondents was from Davao City (48.6%), followed by Digos City (10.3%).

[12] Conversion to AUD based on exchange rate of www.xe.com/currencyconverter/ as per 01 June 2010

Table 5-1: Socio-demographic profile of general public respondents

(n=646)

Variable	Distribution	
	Frequency	%
Place of residence		
Davao City	284	44.0
Digos City	75	11.6
Sta. Cruz	51	7.9
Bansalan	52	8.0
Kidapawan City	61	9.4
Makilala	50	7.7
Magpet	50	7.7
Other	23	3.6
Gender		
Male	287	44.4
Female	359	55.6
Age group		
15 years old and below	13	2.0
16-25 years old	215	33.3
26-35 years old	157	24.3
36-45 years old	138	21.4
46-55 years old	94	14.6
56-65 years old	19	2.9
66 years and older	10	1.5
Highest level of formal education		
No formal schooling	1	0.2
Some elementary	8	1.2
Elementary graduate	26	4.0
Some high school	41	6.3
High school graduate	136	21.1
Some college	164	25.4
Vocational educational	23	3.6
College graduate	206	31.9
Post graduate	41	6.3
Monthly personal income before taxes (PhP)		
<3,333	231	35.8
3,333 – 4,999	84	13.0
5,000 – 6,666	70	10.8
6,667 – 8,332	70	10.8
8,333 – 10,832	50	7.7
10,833 – 13,332	41	6.3
13,333 – 15,832	24	3.7
15,833 – 18,332	19	2.9
18,333 – 20,832	16	2.5
20,833 – 23,332	14	2.2
23,333 – 25,832	9	1.4
25,833 and above	18	2.8

Table 5-2: Socio-demographic profile of household water user respondents

(n=638)

Variable	Distribution	
	Frequency	%
Place of residence		
Davao City	310	48.6
Digos City	66	10.3
Sta. Cruz	50	7.8
Bansalan	50	7.8
Kidapawan City	60	9.4
Makilala	50	7.8
Magpet	52	8.2
Gender		
Male	178	27.9
Female	460	72.1
Age group		
15 years old and below	0	0.0
16-25 years old	59	9.2
26-35 years old	167	26.2
36-45 years old	160	25.1
46-55 years old	162	25.4
56-65 years old	64	10.0
66 years and older	26	4.1
Highest level of formal education		
No formal schooling	0	0.0
Some elementary	17	2.7
Elementary graduate	31	4.9
Some high school	66	10.3
High school graduate	150	23.5
Some college	164	25.7
Vocational educational	17	2.7
College graduate	173	27.1
Post graduate	20	3.1
Monthly household income before taxes (PhP)		
<3,333	44	6.9
3,333 – 4,999	53	8.3
5,000 – 6,666	87	13.6
6,667 – 8,332	69	10.8
8,333 – 10,832	84	13.2
10,833 – 13,332	71	11.1
13,333 – 15,832	56	8.8
15,833 – 18,332	33	5.2
18,333 – 20,832	28	4.4
20,833 – 23,332	20	3.1
23,333 – 25,832	12	2.4
25,833 and above	78	12.2

The majority (72.1%) of household water user respondents were female. This is because the interviews were conducted during the day when most (male) heads of households were at work and the female heads of household were the ones available to answer the survey. The majority of the respondents were less than 46 years old (60%) and had at least some college education (58.6%).

About 64% of respondents reported a monthly household income of less than PhP 13,333 (AUD 314). The mean monthly household income was in the range of PhP 8,333 -13,332 (AUD 196 - 314). Household size ranged from one to 15 members. Both the mean and median household size were five persons.

5.1.3 Climber respondents

There were 431 climber respondents. A summary of the profile of climber respondents is shown in Table 5-3. Of respondents in this subsample, 43.2% resided outside the MANP multiple use zone.[13] Of those living within the MANP multiple use zone, most resided in Davao City.

There were more male climber respondents than females. They were generally young, with more than 85% being less than 36 years old. Only three respondents were older than 55 years. The vast majority (93.7%) had at least some college education and more than half of all climber respondents had finished college. Almost 10% had postgraduate education. More than half of the respondents had a monthly personal income of less than PhP 8333 (AUD 190), while approximately 10% earned more than PhP 25,832 per month (AUD 588).

[13] Place of residency of water users was by definition within the MANP multiple use zone and the vast majority of general public respondents also resided there.

Table 5-3: Socio-demographic profile of climber respondents

(n=431)

Variable	Distribution	
	Frequency	%
Place of residence		
Davao City	140	32.5
Digos City	16	3.7
Sta. Cruz	9	2.1
Bansalan	6	1.4
Kidapawan City	57	13.2
Makilala	11	2.6
Magpet	5	1.2
Other	186	43.2
Gender		
Male	295	68.4
Female	136	31.6
Age group		
15 years old and below	6	1.4
16-25 years old	176	40.8
26-35 years old	192	44.5
36-45 years old	45	10.4
46-55 years old	9	2.1
56-65 years old	3	0.7
Highest level of formal education		
No formal schooling	1	0.2
Some elementary	1	0.2
Elementary graduate	3	0.7
Some high school	3	0.7
High school graduate	19	4.4
Some college	102	23.7
Vocational educational	20	4.6
College graduate	241	55.9
Post graduate	41	9.5
Monthly personal income before taxes (PhP)		
<3,333	103	23.9
3,333 – 4,999	42	9.7
5,000 – 6,666	49	11.4
6,667 – 8,332	47	10.9
8,333 – 10,832	37	8.6
10,833 – 13,332	31	7.2
13,333 – 15,832	27	6.3
15,833 – 18,332	20	4.6
18,333 – 20,832	15	3.5
20,833 – 23,332	6	1.4
23,333 – 25,832	8	1.9
25,833 and above	46	10.7

5.1.4 Differences between respondent groups

There are statistically significant differences in the age and level of education between the three respondent groups (Table 5-4). In particular, climber respondents were significantly younger and better educated than water user and general public respondents, while the general public respondents were generally younger and better educated than the water user respondents (Table 5-5). The differences in age and level of education of respondent groups were all significant ($p<0.001$). Climber respondents had statistically higher personal incomes compared to the other respondent groups ($p<0.001$).

Table 5-4: Analysis of variance of differences in age and highest level of educational attainment among respondent groups

Variable		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	533.5	2	266.7	190.9	.000
	Within Groups	2392.2	1712	1.4		
	Total	2925.7	1714			
Highest level of educational attainment	Between Groups	59.5	2	29.8	75.1	.000
	Within Groups	678.9	1712	.4		
	Total	738.4	1714			

Table 5-5: Post hoc comparisons (Games-Howell test) between subsamples for age and highest level of educational attainment

Dependent Variable	(I) Respondent group	(J) Respondent group	Mean Difference (I-J)	Std. Error	Sig.
Age	Tourists	Water users	-1.396	.064	.000
		General public	-.551	.064	.000
	Water users	Tourist	1.396	.064	.000
		General public	.845	.072	.000
Highest level of educational attainment	Tourists	Water users	.476	.035	.000
		General public	.339	.034	.000
	Water users	Tourist	-.476	.035	.000
		General public	-.137	.038	.001

5.2 Resource utilisation, perceptions and awareness

5.2.1 Water user respondents

5.2.1.1 Household water consumption and supply

Data related to household water supply and consumption are shown in Table 5-6. The average monthly water consumption per household was 20.7 cubic metres, with a median consumption of 16 cubic metres. The lowest reported monthly consumption was five cubic metres per household while the highest reported monthly consumption was 90 cubic metres. Reported monthly water bills in the month immediately preceding the survey ranged from PhP 104 - 2500 (AUD 2.45 - 58.82) per respondent household.

Table 5-6: Water user respondents: water consumption, cost and supply

(n = 638)

	Descriptive statistics			Distribution	
Variable	**Mean**	**Median**	**Std. Dev.**	**Frequency**	**%**
Average monthly water consumption (m^3)	20.7	16.0	12.9		
Water bill in the previous month (PhP)	301.4	250.0	220.9		
Lowest monthly water bill in the past 12 months (PhP)	235.1	185.0	157.6		
Highest monthly water bill in the past 12 months (PhP)	377.4	286.5	275.4		
Has problem with continuity of water supply?					
No				526	82.4
Yes				112	17.6
Household has other source of water?					
No				487	76.3
Yes				151	23.7
Aware that Mt. Apo is source of water of the water district?					
No				249	39.0
Yes				389	61.0

Water user respondents were asked about the continuity of their water supply. All respondents had access to mains water. This was the only source of water for the vast majority of respondents (76%). The majority (61%) were aware that the MANP was the source of mains water. More than two-thirds of the respondents were aware that the MANP was a water catchment area and the source of water for many areas in Mindanao.

5.2.1.2 Water sources other than water utility

Approximately one quarter of respondents stated that they had access to water from other sources in addition to mains water. Figure 5-1 details the other sources and how this water was used. Approximately 12% of households bought bottled water more or less regularly for drinking. Pearson's two-tailed chi-square test showed that the presence of children in the household had no statistically significant effect on the use of bottled water (χ^2 = 27.396, df = 20). Groundwater, rainwater and water from springs or lakes was used mainly for bathing or washing.

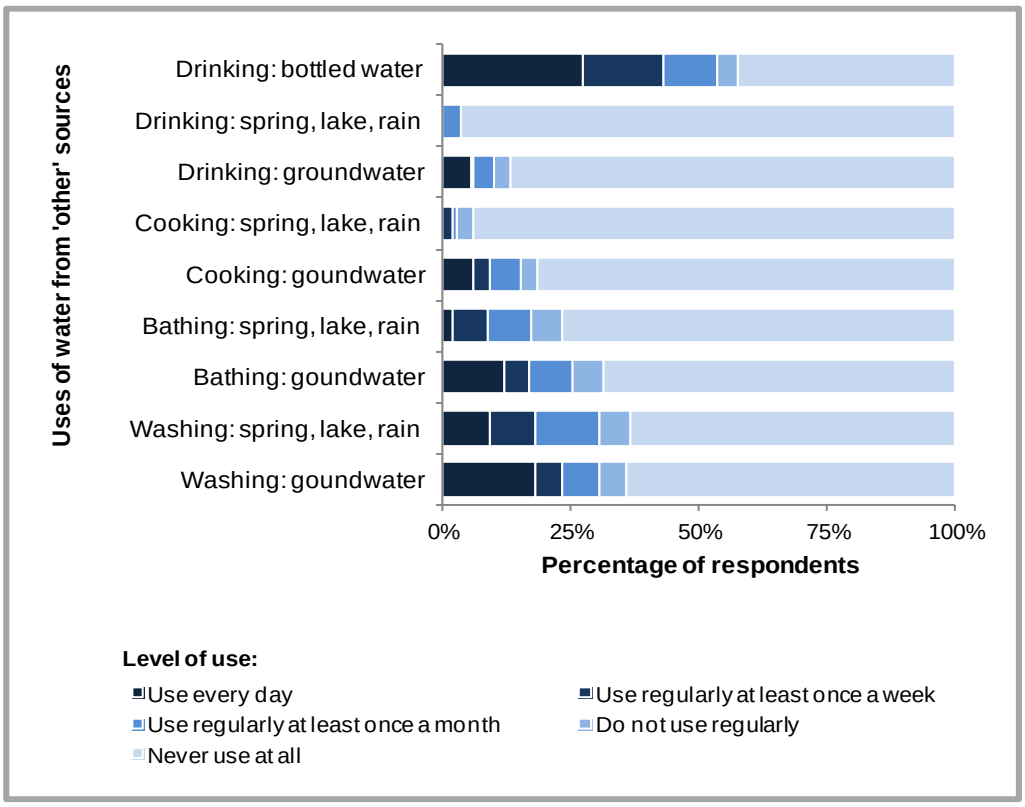

Figure 5-1: Use of additional sources of water by respondent households

(Only respondents who stated that they also accessed other sources of water; n=151)

5.2.1.3 Perceptions about water quality and safety

Table 5-7 summarises respondents' perceptions about the quality of mains water. The majority were in agreement that their water was clear and tasted good, and that there were no odour or contamination issues.

Table 5-7: Perceptions on quality of mains water supplied by utility companies: Agreement of water user respondents with statements about water attributes

(n=638)

Perception about water quality	Percent distribution of responses				
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Water is clear	0.0	0.6	10.3	34.3	54.7
Water tastes good	0.5	0.8	10.7	38.1	50.0
Water has bad smell	51.4	29.5	14.4	3.8	0.9
There may be bacteria in the water	45.3	29.9	19.7	4.2	0.8
There may be traces of heavy metal in the water	53.1	27.9	14.6	3.9	0.5
There may be traces of chemicals in the water	42.0	25.5	20.4	9.6	2.5

In terms of the safety of their water supply, Table 5-8 shows that the majority of respondents agreed that their water supply was “very safe” for drinking, cooking, bathing and washing.

Table 5-8: Perceptions about water safety: Agreement of water user respondents with safety of water for various uses

(n=638)

Perception about water safety	Percent distribution of responses				
	Very unsafe	Unsafe	Neither safe nor unsafe	Safe	Very safe
Water is safe for drinking	0.3	2.4	13.0	29.2	55.2
Water is safe for cooking	0.0	0.2	5.8	21.5	72.6
Water is safe for bathing	0.0	0.0	2.7	14.6	82.8
Water is safe for washing	0.0	0.0	2.4	13.6	84.0

5.2.2 Climber respondents

Climbing Mount Apo is the principal recreational activity in the protected zone of the MANP, and therefore climbers are best at encapsulating the recreational use value of the protected zone. Descriptive statistics related to the climbing activity of respondents are presented in Table 5-9. Climbers tended to climb Mt Apo in the company of friends

(42.5%) or as a member of an organised group (36.9%). Number of travelling in a travelling party ranged from two to 100 persons.[14]

Entry points for climbing Mount Apo are accessible by different modes of transport. Almost half of the climber respondents had utilised only public modes of transportation. Other climber respondents travelled either by private vehicle only (25%) or through a combination of public and private means of transport (26%). Public transportation in the area was usually a combination of bus, jeepney[15] and motorbike. Climbers from outside Mindanao had a flight as one leg of their journey to/from Mount Apo.

Respondents were asked about their previous climbs as well as future plans to climb Mount Apo again. The majority of respondents (67%) had climbed Mount Apo at least once before. On average, climber respondents had climbed Mount Apo 2.3 times prior to the time of the survey. A small number of respondents (3.2%) had climbed Mount Apo more than 10 times previously. The vast majority of respondents indicated that they planned to return (81%), and less than 1% indicated that they had no plan to climb Mount Apo again. On average, climber respondents were away from home for 4.8 days for the climb to Mount Apo, and intended to camp at the peak of the mountain for an average of 3.4 days.[16]

5.2.2.1 Expenses incurred for climbing Mount Apo

Table 5-9 shows the expenses incurred by climber respondents related to climbing Mount Apo. The average entrance fee was PhP 596.50 (AUD 14), which was about 12% of average total expenses. Only climber respondents from outside Mindanao, such as those from Luzon and other countries, incurred accommodation expenses. Fewer than half of the climber respondents paid for a climbing guide. Another possible expense was either the purchase or rent of camping gear.

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[14] As a rule, climbers to Mount Apo are not allowed to climb alone.

[15] Jeepneys are the most popular means of public transportation in the Philippines. They are known for their crowded seating and kitsch decorations, which have become a ubiquitous symbol of Philippine culture and art. Jeepneys were originally made from U.S. military jeeps left over from World War II (http://en.wikipedia.org/wiki/Jeepney).

[16] Climbing to the peak of Mount Apo from the various entry points to the protected area typically takes from eight hours to two days, depending on the climbing trail used and the climber's level of fitness.

Table 5-9: Descriptive statistics of trip-related variables for climber respondents

(n=431)

Variable	Distribution		Descriptive statistics		
	Frequency	%	Mean	Median	Std. Dev.
Type of travel group					
Family	7	1.6			
Friends	183	42.5			
Family and friends	80	18.6			
School group	2	0.5			
Organised group	159	36.9			
Mode of transport use to entry point					
Public transportation	212	49.2			
Private vehicle	108	25.1			
Combination of public & private	111	25.8			
Plan to climb Mount Apo again in the future					
No	4	0.9			
Not sure	77	17.9			
Yes	350	81.2			
Number of previous climbs to Mount Apo			2.3	1.0	3.0
Number of days away from home for the trip			4.8	4.0	3.8
Number of days intending to stay at Mount Apo			3.4	3.0	0.8
Number of persons in the travelling group			13.3	11.0	11.0
Expenses for the trip (PhP)					
Entrance/climbing fee (n=431)			596.5	500.0	612.4
Transportation (n=427)			975.2	400.0	1716.1
Food (n=426)			582.8	500.0	397.6
Accommodation (n=118)			687.4	500.0	707.7
Guide (n=205)			548.4	500.0	445.6
Other (n=72)			1481.3	500.0	1792.6

5.2.2.2 Motivations for climbing Mount Apo and likely alternative activities

Mount Apo attracted climbers predominantly because it was the highest mountain in the Philippines (Figure 5-2). More than two-thirds of climber respondents indicated that ‘sharing nature experience with family and friends’ strongly motivated them. Almost half of the respondents ‘just wanted to climb Mount Apo’. A chance to see a Philippine eagle, *Pithecophaga jefferyi*, or other rare plants and animals, and ‘Mount Apo being a sacred mountain’, were less important motivators.

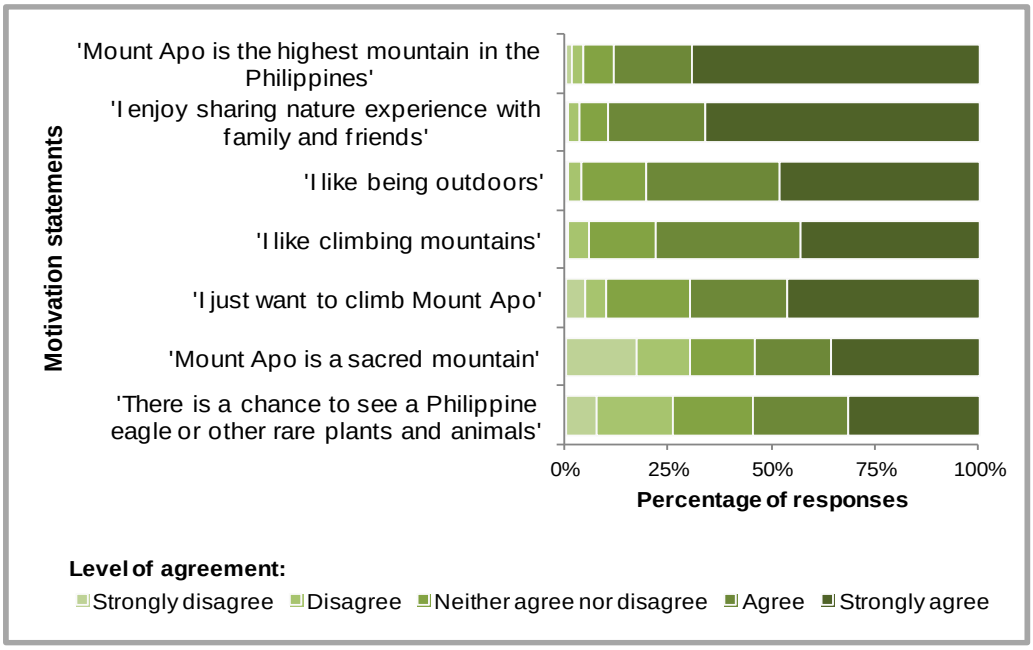


Figure 5-2: Agreement of climber respondents with motivation statements for climbing Mount Apo, Mindanao, the Philippines

(n=431)

Climber respondents were asked about their likely activities if they were not climbing Mount Apo. Figure 5-3 shows that almost half of the respondents would likely work or visit other tourist destinations.[17]

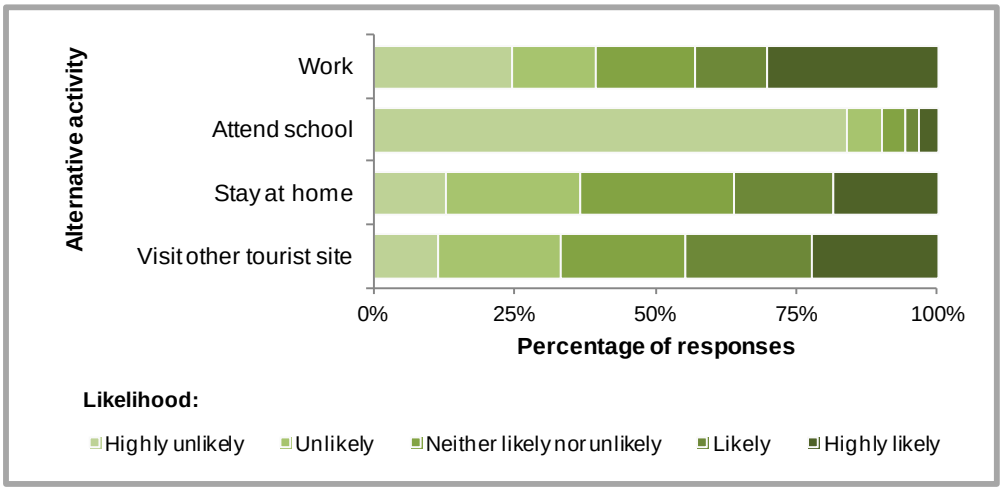


Figure 5-3: Likelihood of climber respondents engaging in alternative activities to climbing Mount Apo, Mindanao, the Philippines

(n=431)

[17] The climbing seasons coincide with the two school holidays during the year—the three-month summer holiday and the one-month semester holiday. The summer climbing season also coincides with the Easter holidays.

5.2.3 General public respondents

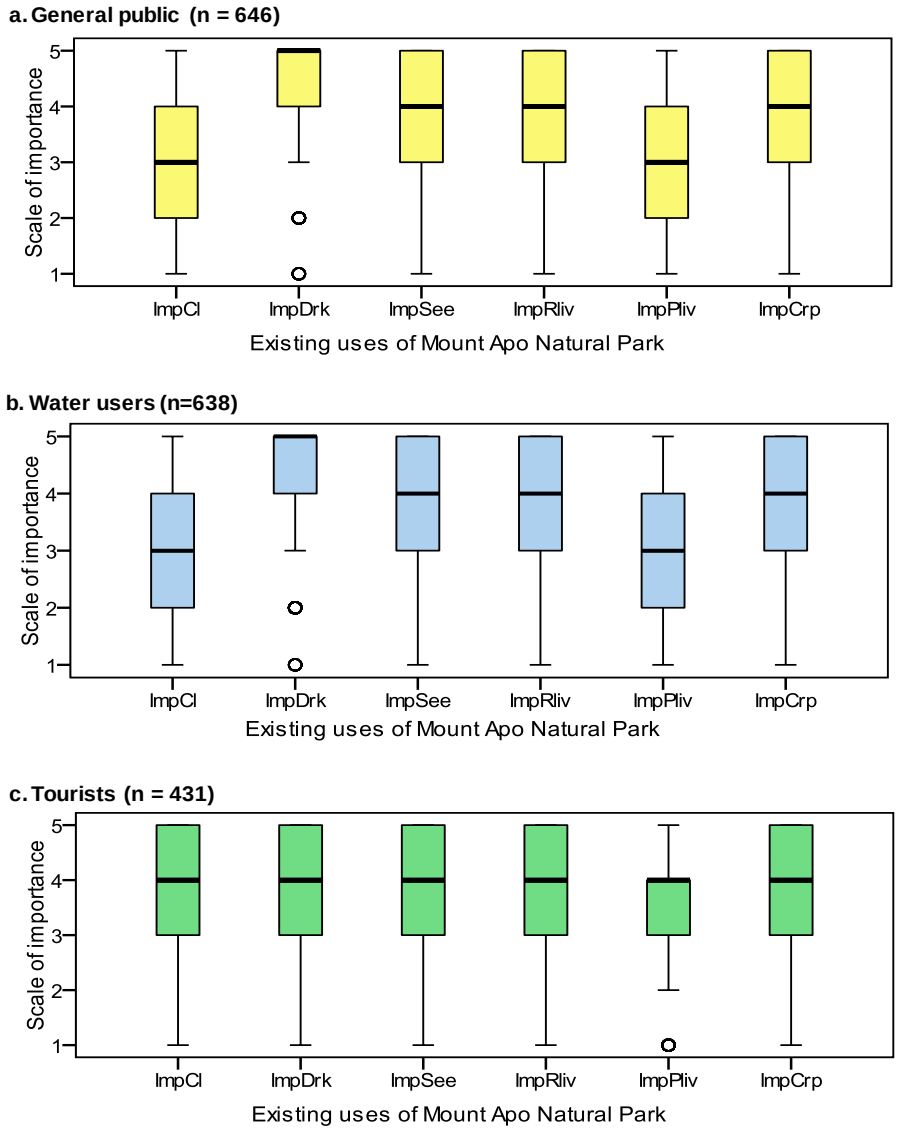
The vast majority of the general public respondents (81.3%) indicated that they were aware of MANP as a water catchment area and source of water for many areas in Mindanao. Although few (14.6%) had climbed Mount Apo, more than half of the general public respondents (53.1%) indicated that they intended to climb it in the future. The vast majority (90.7%) indicated that they were aware that the MANP protected area contains rare endemic animal and plant species.

5.3 Values attributed to the Mount Apo Natural Park

All respondents were asked about the importance they attached to various uses of the MANP. Figure 5-4 shows the level of importance attached by the respondent groups to each use. The climber respondents attached higher importance to climbing than general public and water user respondents.

MANP as a source of safe drinking water was more important for general public and water user respondents than for climbers. All three respondent groups placed the same level of importance on the MANP as a place for rare plants and animals to live and a place for growing crops. The MANP as a place where people live was rated the least important across all respondent groups.

Table 5-10 shows that, at 1% level of significance, the different respondent groups attached different levels of importance to the MANP as a place for climbing, as a water catchment area and a source of safe drinking water, and as a place where people live. This difference is analysed in Table 5-11 and illustrates the different user perspectives. ‘The MANP as a place for climbing’ was significantly more important to climber respondents than the general public or water user respondents ($p<0.001$).



Uses:

ImpCl	=	People are able to climb Mount Apo
ImpDrk	=	People can safely drink water that comes from Mount Apo catchment areas
ImpSee	=	People can see the Philippine eagle or other rare plants and animals in MANP
ImpRlive	=	The Philippine eagle and other rare plants and animals live in MANP
ImpPliv	=	People are living on the footslopes of Mount Apo
ImpCrp	=	Food crops are being grown on the footslopes of Mount Apo

Level of importance:
1 = Not at all important; 2 = Not important; 3 = Neutral; 4 = Important; 5 = Very important

Figure 5-4: Importance attributed to different use and non-use values of the Mount Apo Natural Park, Mindanao, the Philippines, by respondent group

Legend: : a) Contains the middle 50% of of the values, bounded by the 25th percentile (on the left) and 75th percentile (on the right); b) thick line inside the "box" = median value'; c) "whiskers" extend to the minimum (left of the "box") and maximum (right of the "box") values that are not outliers or extreme values

o : "Outlier" = extreme values: 1.5-3 times the minimum value

Table 5-10: Differences in importance attached by the three respondent groups to the different uses of the Mount Apo Natural Park, Mindanao, the Philippines

Variable		Sum of Squares	df	Mean Square	F	Sig.
Importance of Mount Apo for climbing	Between Groups	229.70	2	114.85	70.20	.000
	Within Groups	2801.04	1712	1.64		
	Total	3030.74	1714			
Importance of MANP as a water catchment area and source of safe drinking water	Between Groups	17.17	2	8.59	8.27	.000
	Within Groups	1776.71	1712	1.04		
	Total	1793.89	1714			
Importance of seeing Philippine eagle and other rare plants and animals in MANP	Between Groups	3.36	2	1.68	1.29	.276
	Within Groups	2232.02	1712	1.30		
	Total	2235.38	1714			
Importance of Philippine eagle and other rare plants and animals living in MANP	Between Groups	1.40	2	.70	.61	.545
	Within Groups	1976.77	1712	1.15		
	Total	1978.17	1714			
Importance of people living on the footslopes of Mount Apo	Between Groups	76.68	2	38.34	22.16	.000
	Within Groups	2961.83	1712	1.73		
	Total	3038.50	1714			
Importance of food crops being grown on the footslopes of Mount Apo	Between Groups	4.14	2	2.07	1.21	.297
	Within Groups	2920.45	1712	1.71		
	Total	2924.59	1714			

‘The MANP as a source of safe drinking water’ was significantly more important to the general public ($p<0.001$) and water user respondents ($p=0.002$) than climber respondents. ’The MANP as a place where people live’ was significantly more important to climber respondents than the general public ($p<0.001$) and water user respondents ($p<0.001$). However, no significant difference was found in the importance attached by the three respondent groups to the other uses of the MANP.

Table 5-11: Differences between respondent groups in the importance attached to the various uses of the Mount Apo Natural Park, Mindanao, the Philippines (Games-Howell post hoc multiple comparisons test)

Dependent Variable	(I) Respondent group	(J) Respondent group	Mean Difference (I-J)	Std. Error	Sig.
Importance of Mount Apo for climbing	Tourists	Water users	.914	.076	.000
		General public	.736	.073	.000
	Water users	Tourists	-.914	.076	.000
		General public	-.178	.074	.044
Importance of MANP as a water catchment area and source of safe drinking water	Tourists	Water users	-.218	.065	.002
		General public	-.241	.064	.000
	Water users	Tourists	.218	.065	.002
		General public	-.022	.056	.917
Importance of seeing Philippine eagle and other rare plants and animals at MANP	Tourists	Water users	-.029	.073	.914
		General public	-.106	.072	.308
	Water users	Tourists	.029	.073	.914
		General public	-.076	.063	.445
Importance of Philippine eagle and other rare plants and animals living in MANP	Tourists	Water users	-.015	.068	.975
		General public	-.066	.067	.585
	Water users	Tourists	.015	.068	.975
		General public	-.052	.060	.658
Importance of people living on the footslopes of Mount Apo	Tourists	Water users	.544	.079	.000
		General public	.360	.079	.000
	Water users	Tourists	-.544	.079	.000
		General public	-.184	.075	.040
Importance of food crops being grown on the footslopes of Mount Apo	Tourists	Water users	-.007	.080	.996
		General public	.097	.078	.426
	Water users	Tourists	.007	.080	.996
		General public	.104	.074	.342

6 Willingness to pay for watershed protection

6.1 Chapter synopsis

This chapter explores how different variables influenced the willingness to pay for watershed protection in the MANP for the general public and water user respondents. Table 6-1 shows a summary overview of variables with significant influences and the direction of influence.

Table 6-1: Overview of variables that influenced respondents' willingness to pay for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines, by respondent group and WTP elicitation format

(n=638 water users, n=646 general public respondents)

			Explanatory variable										
Sample	**Form of payment**	**WTP elicitation format**	Bid amount (PhP)[1]	Age (category)	Gender (0=male, 1=female)	Education (category)	Income (category)	Residence: Magpet	Residence: Davao City	Awareness of MANP as water catchment area (0=no, 1=yes)	Awareness that MANP is source of mains water (0=no, 1=yes)	Problem with continuity of water supply (0=no, 1=yes)	Importance of MANP as source of safe drinking water (0=no; 1=yes)
Water users	One-off payment	Dichotomous choice	---	--	-	.	+++	+++	+++	.	n/a	n/a	+++
		Open ended	+++	---	.	.	+++	+++	+++	.	n/a	n/a	+++
Water users	Recurring monthly payment	Dichotomous choice	---	.	.	.	+++	+++	.	n/a	++	++	n/a
		Open ended	+++	+++	.	---	+++	+++	+++	n/a	+++	+++	+++
General public	One-off payment	Dichotomous choice	---	--	.	.	+++	+++	+++	+++	n/a	n/a	++
		Open ended	+	.	.	.	+++	+++	+++	.	n/a	n/a	+

[1] dichotomous-choice bid amount

---, --, - negative coefficient, significant at p<0.01, p<0.05, p<0.1 respectively

+++, ++, + positive coefficient, significant at p<0.01, p<0.05, p<0.1 respectively

. variable not found to be significant

n/a variable not included in the model

The chapter is divided into four sections. Section 6.2 describes the model parameters and welfare estimates based on a one-off payment for watershed protection. Section 6.43 presents the model parameters and welfare estimates of a monthly payment. Section 6.54 presents the reasons why some respondents were unwilling to pay for watershed protection in the MANP.

6.2 Willingness to make a one-off payment: model parameters and welfare estimates based on dichotomous choice bids

Water user and general public respondents were presented with dichotomous-choice bids to make a one-off payment to support watershed protection in the MANP. Each respondent was asked to indicate his or her willingness to pay a randomly drawn bid amount, which ranged from PhP 100 to PhP 1000 (AUD 2.35 to AUD 23.53), in PhP 100 (AUD 2.35) increments. The amount was defined to apply per household for water users and per person for general public respondents. Figure 6-1 shows the level of acceptance by the respondents at the bid levels. In general, the percentage of respondents willing to pay decreased as the bid amount increased, and fewer water user respondents were willing to pay a given bid amount compared to general public respondents.

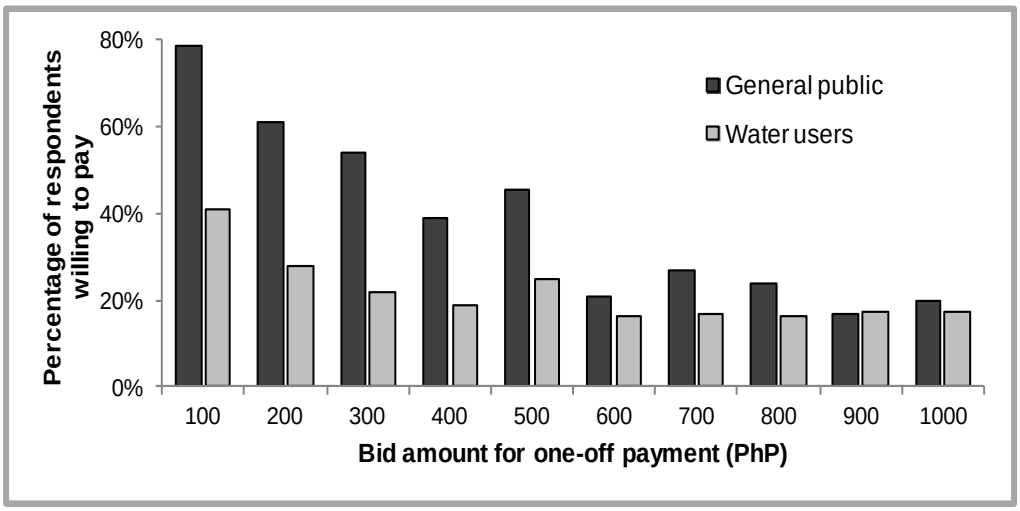


Figure 6-1: Level of acceptance of bid levels for one-off payment for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines, by respondent group

(Sample size n=646 general public, 638 water users. Payment amount is per person for general public and per household for water users)

Of respondents offered the lowest bid of PhP 100 (AUD 2.35), Almost 80% of general public respondents and 40% of water user respondents were willing to pay. About 21% of general public respondents and 19% of water user respondents were willing to pay the maximum bid of PhP 1000 (AUD 23.53), which may be interpreted as indicator of fat tail distribution. However, the high percentage of respondents willing to pay close to the mean WTP amount of PhP 520 (Table 6-2) is an evidence against fat tails (Kelly & Tan 2015). The relatively high percentage of respondents willing to pay the highest bid can be an indicator of the high importance respondents placed to watershed protection of that the highest bid was considered low relative to their income.

Table 6-2 shows the results of the logit model for the two samples and the combined sample, and the resulting welfare estimates for the two samples only. For all three models, the bid amount was negatively correlated with a willingness to pay ($p<0.001$). In regard to socio-demographic variables, age was negatively correlated with a willingness to pay ($p<0.001$ for the combined sample; $p=0.045$ for general public and $p=0.018$ for water user samples). Gender was negatively correlated with a willingness to pay in the combined sample ($p=0.002$) and water user sample ($p=0.052$). For all three models, significant positive correlations were found between willingness to pay and income ($p<0.001$), 'residence in Magpet' ($p<0.001$ for the combined sample and general public respondents; $p=0.002$ for water user respondents), and 'residence in Davao City' ($p<0.001$).

Willingness to pay was positively correlated with respondents' awareness of MANP as a water catchment area ($p=0.013$ for the combined sample; $p=0.007$ for the general public sample). There was also a positive correlation between willingness to pay and respondent attitude relating to the importance of the MANP as a water catchment and source of safe water ($p<0.001$ for the combined sample; $p=0.004$ for the general public sample; $p=0.009$ for the water user sample).

The chi-square results indicated that all models were statistically significant ($p<0.001$). The logit models have moderate to strong predictive power as suggested by the McFadden pseudo R^2 coefficients.

The results of the logistic regression were consistent with economic theory on the negative influence of bid amount on willingness to pay. Respondents who were younger, had higher incomes, and lived in Magpet or Davao City were more likely to accept the bid amount compared to older respondents, those with lower incomes and those who resided in other areas. A willingness to accept the bid amount was positively influenced by respondents' awareness and recognition of the hydrologic services provided by the MANP.

Table 6-2: Logit model parameters of respondents' willingness to pay a one-off payment for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines, by respondent group

	All respondents		General public		Water users	
Variable	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Constant	-1.612 ***	0.546	-0.562	0.787	-3.012 ***	0.904
Bid amount (PhP)	-2.493 ***	0.252	-3.695 ***	0.382	-1.672 ***	0.389
Age (category)[a/]	-0.255 ***	0.056	-0.172 **	0.086	-0.203 **	0.086
Gender (0=male; 1=female)	-0.425 ***	0.140	-0.225	0.195	-0.468 *	0.241
Highest level of educational attainment (category)[b/]	0.053	0.055	-0.068	0.083	0.002	0.087
Monthly income before taxes (category)[c/]	0.146 ***	0.023	0.262 ***	0.042	0.195 ***	0.037
Place of residence: Magpet	1.539 ***	0.265	2.317 ***	0.391	1.458 ***	0.480
Place of residence: Davao City	1.066 ***	0.151	1.124 ***	0.220	1.585 ***	0.265
Awareness about MANP as a water catchment area and source of water for many areas in Mindanao (0=no; 1=yes)	0.411 **	0.165	0.693 ***	0.258	0.017	0.237
'Importance of MANP water catchment areas as source of safe drinking water' (0=not important; 1=important)	0.291 ***	0.075	0.212 **	0.103	0.328 ***	0.125
Model fit:						
Number of observations	1284		646		638	
Log likelihood	-659.66		-328.37		-274.39	
McFadden pseudo R^2	0.16		0.24		0.18	
Chi-square$_{df=9}$	257.43 ***		205.53 ***		122.63 ***	
Welfare estimates (PhP)[d/]						
Mean WTP			519.64		238.90	
Median WTP			519.62		231.73	
WTP confidence interval (95%)			452.23 - 595.68		183.86 - 332.78	

***, **, * significant at p<0.01, p<0.05, p<0.1 respectively

[a/] 1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/] 1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/] For general public: personal income; for water users: household income; 1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

[d/] not estimated for combined sample because the WTP of general public respondents is per person while the WTP of water users is per household

The resulting welfare estimates from dichotomous-choice bids indicated that, on average, general public respondents were willing to make a one-off payment of PhP 520 per person (AUD 12.24), while water user respondents were willing to make a one-off payment of PhP 239 per household (AUD 5.62) to support watershed protection in the MANP. The mean WTP of general public respondents was significantly higher than that of household water user respondents ($p<0.001$). A possible explanation for the difference could be that general public respondents were not responsible for paying the household water bill and not affected by the household expenses on water. Household water user respondents were responsible for allocating household budget for various expenditures items.

6.3 Willingness to pay based on open-ended bids for one-off payment for watershed protection

The anchored open-ended format involved asking an open-ended willingness to pay question after the dichotomous choice question. General public and water user respondents were asked to nominate the maximum one-off payment they were willing to make to support watershed protection in the MANP. Again, for the general public the amount applied per person, and for water users per household. Figure 6-2 shows the maximum amount that respondents were willing to pay for watershed protection in the MANP. Fewer people nominated higher amounts. The stated maximum willingness to pay amount ranged from zero to PhP 3000 (AUD 70.59) per person for the general public sample and zero to PhP 1000 (AUD 23.53) per household for the water user sample. The minimum willingness to pay amount at the ten percentile for general public respondents was PhP 800 (AUD 18.82) per person, and for water user respondents PhP 500 (AUD 11.76) per household.

Table 6-3 shows the factors that were associated with willingness to pay amounts and resulting welfare estimates from open-ended bids for watershed protection. Across all Tobit models of one-off payment, a significant positive correlation was found between willingness to pay and both income ($p<0.001$) and residence in Magpet ($p<0.001$) or Davao City ($p<0.001$). There was a positive but not significant correlation between willingness to pay and ‘awareness of the MANP as water catchment area’ for the combined sample, but there was a significant positive correlation between willingness to pay and respondent attitude relating to the importance of the MANP as a water catchment area and source of safe drinking water ($p=0.094$ for the general public sample; $p=0.003$ for the water user sample).

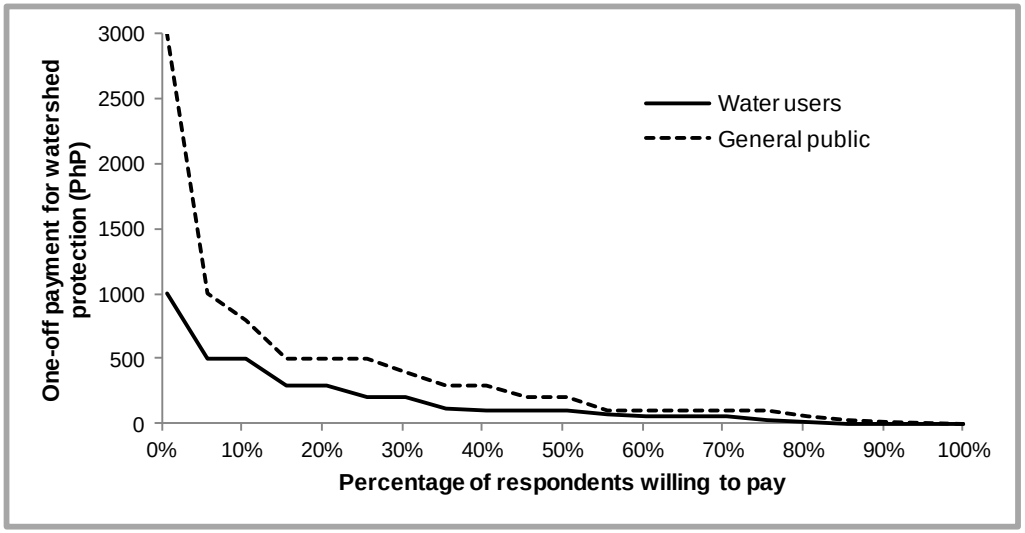


Figure 6-2: Willingness to pay curve of one-off payment for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines, by respondent group

(N=646 general public, n=638 water users. Payment amount applies per person for general public and household for water users)

There was also significant positive correlation between bid amount and stated maximum willingness to pay amount ($p=0.083$ for the general public sample; $p<0.001$ for the water user sample). The results indicate the presence of anchoring bias.

The results also suggested that higher-income water user respondents from Magpet and Davao City were willing to pay higher amounts for watershed protection compared to lower-income respondents residing elsewhere in the multiple use zone of the MANP. Water user respondents who were younger were willing to pay a higher amount compared to older respondents. The maximum amount of one-off payment for watershed protection was also positively influenced by water user respondents' recognition of the hydrologic services provided by the MANP.

The resulting welfare estimates indicated that, on average, general public respondents were willing to make a maximum one-off payment of PhP 439 (AUD 10.32) per person, while water user respondents were willing to make a maximum one-off payment of PhP 192 (AUD 4.52) per household, to support watershed protection in the MANP.

Table 6-3: Tobit model parameters of maximum one-off amount that respondents would be willing to pay and resulting welfare estimates for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines, by respondent group

	General public		Water users	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
Constant	-0.241	0.205	-0.221 ***	0.085
Bid amount (PhP)	0.149 *	0.086	0.259 ***	0.036
Age (category)[a/]	-0.011	0.022	-0.028 ***	0.008
Gender (0=male; 1=female)	-0.072	0.050	-0.024	0.023
Highest level of educational attainment (category)[b/]	0.003	0.021	0.003	0.008
Monthly income before taxes (category)[c/]	0.043 ***	0.010	0.019 ***	0.004
Place of residence: Magpet	0.348 ***	0.097	0.209 ***	0.041
Place of residence: Davao City	0.220 ***	0.055	0.185 ***	0.023
Awareness about MANP as a water catchment area and source of water for many areas in Mindanao (0=no; 1=yes)	0.080	0.065	0.027	0.024
'Importance of MANP water catchment areas as source of safe drinking water' (0=not important; 1=important)	0.043 *	0.026	0.030 ***	0.010
Disturbance standard deviation				
Sigma	0.620 ***	0.018	0.252 ***	0.008
Model statistics				
Number of observations	646		638	
Log likelihood	-603.30		-103.27	
Welfare estimates (PhP)				
Mean WTP	439.06		192.27	
Median WTP	415.07		178.58	
WTP confidence interval (95%)	250.49 - 775.06		51.74 - 392.23	

***, **, * significant at p<0.01, p<0.05, p<0.1 respectively

[a/] 1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/] 1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/] For general public: personal income; for water users: household income; 1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

Figure 6-3 shows the Tobit-estimated willingness to pay curves of one-off payment for watershed protection in the MANP. The per-person willingness to pay of general public respondents is higher than the per-household willingness to pay of household water users. There is statistically significant difference ($p<0.001$) in willingness to pay of general public respondents and household water user respondents. As stated in the previous section, this could be because general public respondents were not confronted by the budgetary decision-making that household water user respondents had to address.

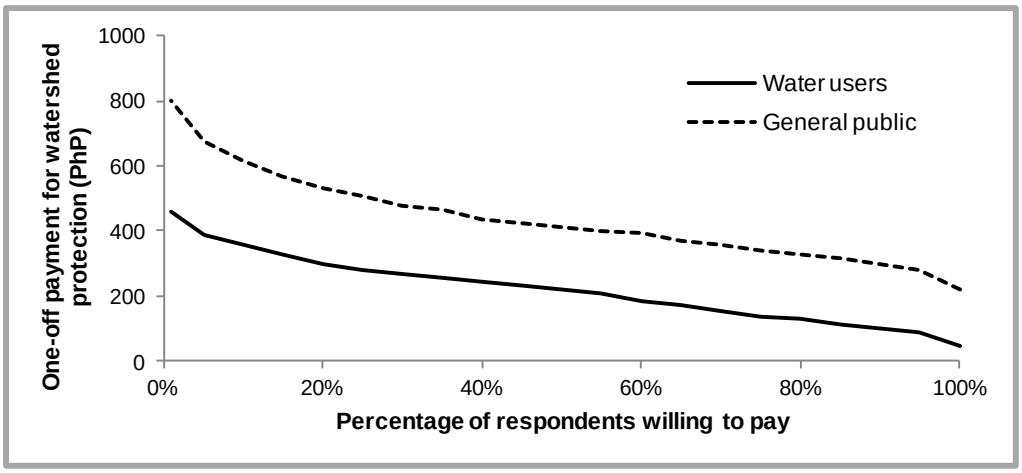


Figure 6-3: Tobit-estimated willingness to pay curve for one-off payment for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines, by respondent group

(N=646 general public, n=638 water users. Payment is per person for general public and per household for water users)

6.4 Willingness of water user respondents to pay a recurring monthly payment: model parameters and welfare estimates

Water user respondents were also asked about their willingness to make a recurring monthly payment for watershed protection in the MANP on top of their monthly water bill. Again, the format was anchored open-ended. In the dichotomous choice question, respondents were presented with a random bid between PhP 25 (AUD 0.59) and PhP 250 (AUD 59) in PhP 25 increments. This was followed up by a question which asked respondents to nominate the maximum amount they were willing to pay monthly on top of their water bill.

6.4.1 Analysis of dichotomous bid responses

Figure 6-4 shows the willingness of water user respondents to accept dichotomous-choice bids for monthly payments. The percentage of respondents who were willing to accept the bid for monthly payment decreased as the bid amount increased. Of those offered the lowest bid of PhP 25/month (AUD 0.59/month), about 35% were willing to accept the bid amount. In contrast, fewer than 10% of water user respondents were willing to accept the highest bid amount of PhP 250/month (AUD 5.88/month).

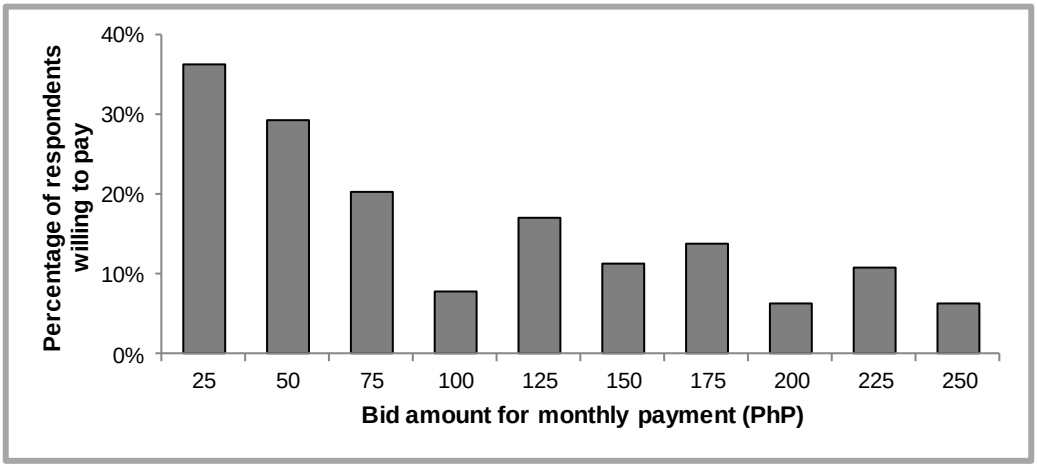


Figure 6-4: Distribution of water user respondents according to the willingness to pay initial bid for monthly payment for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines

(n=638)

Table 6-4 shows the factors associated with willingness to pay and resulting welfare estimates from monthly dichotomous-choice bids. Significant negative correlation was found between willingness to pay and bid amount ($p<0.001$), as well as willingness to pay and 'problem with continuity of water supply' ($p=0.042$). Willingness to pay monthly for watershed protection was found to be significantly positively correlated with household income ($p<0.001$), residence in Magpet ($p<0.001$), and an 'awareness of the MANP as source of water supply' ($p=0.019$).

The results indicate that higher-income water user respondents and those who resided in Magpet were willing to pay more compared to lower-income respondents and those who resided elsewhere. Water user respondents who were aware of the

MANP as the source of their water and had no problem with continuity of water supply were willing to pay more to support watershed protection in the MANP than those who were not aware or had interruptions to their water supply.

Table 6-4: Logit model parameters of water user respondents' willingness to pay a monthly payment and resulting welfare estimates for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines

Variable	Coefficient	Std. Error
Constant	-2.074 **	0.965
Bid amount (PhP)	-10.010 ***	1.767
Age (category)[a/]	-0.140	0.094
Gender (0=male; 1=female)	-0.156	0.260
Highest level of educational attainment (category)[b/]	-0.041	0.094
Monthly household income before taxes (category)[c/]	0.190 ***	0.041
Place of residence: Magpet	1.666 ***	0.439
Place of residence: Davao	0.237	0.278
Problem with continuity of water supply (0=no; 1=yes)	-0.878 **	0.432
Awareness about MANP as the source of their water supply (0=not aware; 1=aware)	0.639 **	0.273
'Importance of MANP water catchment areas as source of safe drinking water' (0=not important; 1=important)	0.177	0.132
Model fit:		
Number of observations	638	
Log likelihood	-238.36	
McFadden pseudo R^2	0.15	
Chi-square$_{df=10}$	87.34 ***	
Welfare estimates (PhP)		
Mean WTP	48.25	
Median WTP	47.88	
WTP confidence interval (95%)	38.62 - 68.22	

***, ** significant at p<0.01, p<0.05 respectively

[a/]1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/]1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/]1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

The chi-square coefficient means that the model was significant at $p<0.001$ and therefore had moderate predictive power. The model was reliable with moderate predictive power as indicated by the McFadden pseudo R^2 of 0.15. The resulting welfare estimates from dichotomous-choice bids showed that household water users were willing to pay an average PhP 48 (AUD 1.13) per household per month on top of their monthly water bill to support watershed protection in the MANP.

6.4.2 Analysis of stated maximum willingness to pay amounts

Figure 6-5 shows the willingness to pay curve of maximum monthly payment that water user respondents were willing to make for watershed protection in the MANP. The highest amount nominated by water user respondents was PhP 300 (AUD 7.06), and the median amount was PhP 20 (AUD 0.47) per household. About 10% of respondents were willing to pay at least PhP 100 (AUD 2.35). About 18% of respondents stated that they were not willing to make monthly payments for watershed protection.

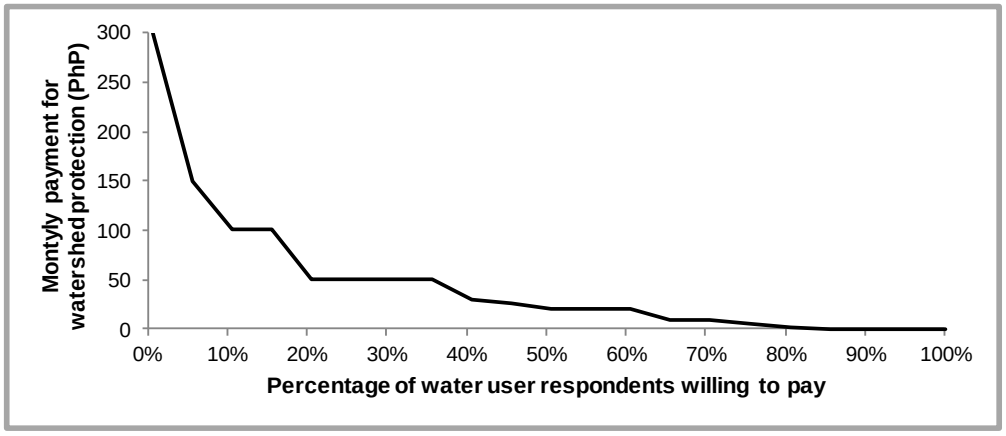


Figure 6-5: Willingness to pay curve from household water user respondents' open-ended bids for monthly payment for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines

(n=638)

Table 6-5 shows the factors that were associated with willingness to pay and the resulting welfare estimates from open-ended bids for monthly payments for watershed protection in the MANP. Willingness to pay amount was found to be

significantly positively correlated with income (p<0.001), residence in Magpet (p<0.001), residence in Davao City (p<0.001), 'awareness of the MANP as source of their water' (p<0.001), and respondents' attitude to the 'importance of the MANP as a water catchment area and source of safe drinking water' (p=0.028). Significant negative correlations were found between willingness to pay amount and education (p=0.004).

Table 6-5: Tobit model parameters of the maximum amount that water user respondents would be willing to pay and resulting welfare estimates monthly for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines

Variable	Coefficient	Std. Error
Constant	-0.126 ***	16.125
Bid amount (PhP)	0.533 ***	0.030
Age (category)[a/]	0.001	0.002
Gender (0=male; 1=female)	0.006	0.005
Highest level of educational attainment (category)[b/]	-0.005 ***	1.739
Monthly household income before taxes (category)[c/]	0.006 ***	0.904
Place of residence: Magpet	0.048 ***	0.009
Place of residence: Davao	0.024 ***	0.000
Problem with continuity of water supply (0=no; 1=yes)	-0.007	0.007
Awareness about MANP as the source of their water supply (0=not aware; 1=aware)	0.060 ***	5.381
'Importance of MANP water catchment areas as source of safe drinking water' (0=not important; 1=important)	0.003	0.002
Disturbance standard deviation		
Sigma	0.061 ***	0.002
Model statistics		
Number of observations	638	
Log likelihood	483.186	
Welfare estimates (PhP)		
Mean WTP	41.09	
Median WTP	38.06	
WTP confidence interval (95%)	13.24 - 81.02	

*** significant at p<0.01

[a/] 1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/] 1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/] 1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

The results suggested that water user respondents with less formal education were willing to pay more to support watershed protection in the MANP. Higher-income respondents and those who resided in Magpet were also willing to pay more to support watershed protection. The awareness of water user respondents relating to the hydrologic services provided by the MANP also had a significant positive influence on the amount they were willing to pay to support watershed protection. The welfare estimates from the open-bids indicate that, on average, household water user respondents were willing to pay PhP 47.71 (AUD 1.12) per household per month.

Figure 6-6 shows the Tobit-estimated willingness to pay curve of monthly payment for watershed protection in the MANP.

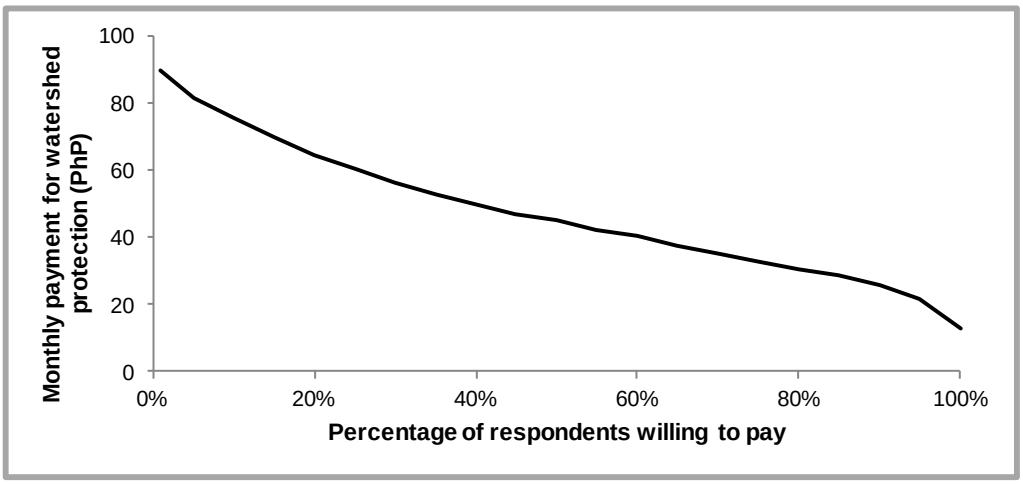


Figure 6-6: Tobit-estimated willingness to pay curve of household water users' monthly payment for watershed protection in the Mount Apo Natural Park, Mindanao, the Philippines

(n=638)

6.5 Reasons for protest bids

Protest bids were recorded when respondents stated a zero willingness to pay any amount because they rejected certain aspects of the scenario even though they put a positive value on the amenity or service (Fonta, Ichoku & Kabubo-Mariara 2010). Protest bids are common in contingent studies and can be as high as 50% of all responses, particularly in an open-ended elicitation format (Jones, Sophoulis & Malesios 2008).

6.5.1 Water user respondents

Among water user respondents, bids were considered protest zeros if a respondent indicated a zero maximum amount in the open-ended bids for both one-off payment and monthly payments for watershed protection; eighty-four responses (13%) met this condition for protest bids. Figure 6-7 shows respondents' level of agreement or disagreement with "reason" statements for giving zero bids.

Among water user respondents, the belief that they were 'already paying too much for our water bill' or that 'the government should be responsible for watershed protection' were the most important reasons for protesting against payment. Lack of trust in the organisation that would manage the funds was also a concern for a majority of water user respondents. Income distribution and understanding the link between watershed protection and water supply were of lesser concern among water user respondents.

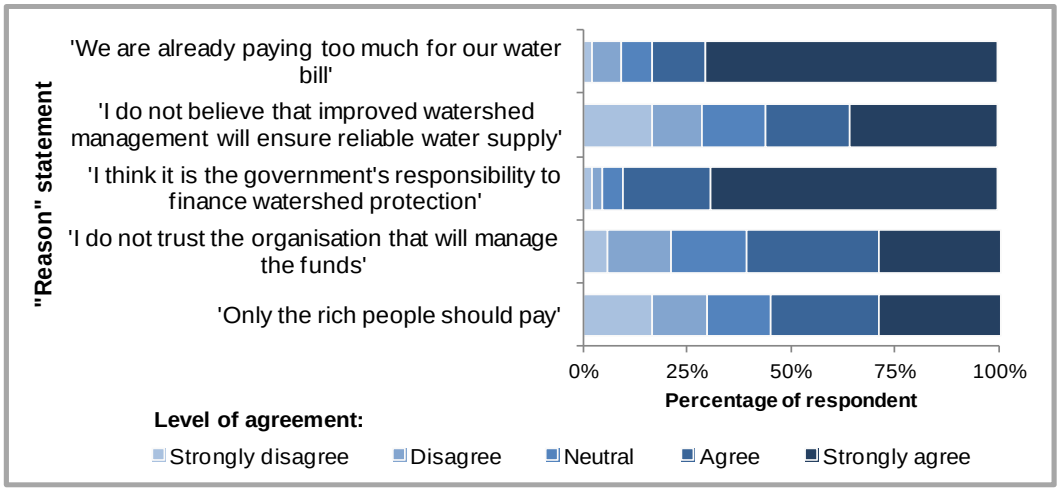


Figure 6-7: Level of agreements with "reason" statements among househowld water user respondents with zero willingness to pay for watershed protection, Mount Apo Natural Park, Mindanao, the Philippines

(n=84)

6.5.2 General public respondents

For general public respondents, a bid was considered a protest if zero was given as the maximum amount in the open-ended bid for one-off payment and the respondent

agreed with the reason statements[18]. Of general public respondents, 7% had protest bids. Figure 6-8 shows the level of agreement with “reason” statements for protest bids among general public respondents.

The majority of general public protest bidders thought that ‘it is the government’s responsibility to finance watershed protection’ (75%), or that they were ’already paying too much for our water bill’ (about 70%). Lack of trust in the organisation that would manage the funds was a concern for about 60% of general public respondents. Income distribution and understanding of the link between watershed management and reliable water supply were less important concerns for general public protest bidders.

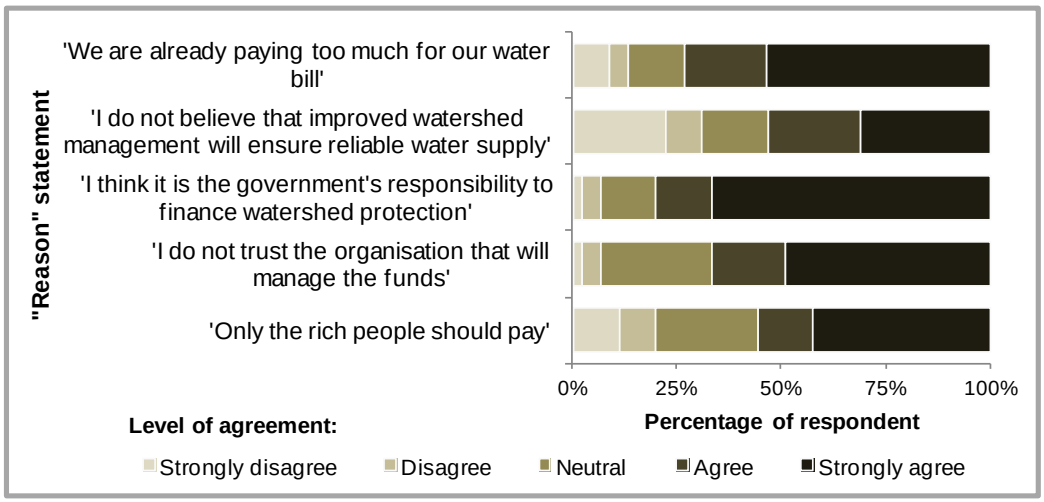


Figure 6-8: Level of agreements with “reason” statements among general public respondents with zero willingness to pay for watershed protection, Mount Apo Natural Park, Mindanao, the Philippines

(n=47)

[18] General public respondents were not asked about monthly payment.

7 Willingness to pay for recreational use

7.1 Chapter synopsis

This chapter discusses the factors that influenced willingness to pay for recreational use of the MANP, principally climbing Mount Apo. Willingness to pay was estimated for climber respondents (users) and general public respondents (potential users). Table 7-1 provides a summary overview of variables that were found to be significantly correlated with respondents' willingness to pay.

Table 7-1: Overview of variables that significantly influenced respondents' willingness to pay for climbing Mount Apo, Mindanao, the Philippines, by respondent group and WTP elicitation format

(n = 1077 combined sample, 646 general public, 431 climbers)

		Explanatory variable							
Respondent group	**WTP elicitation format**	Bid amount (PhP)[1]	Age (category)	Gender (0=male; 1=female)	Education (category)	Income (category)	Residence: outside MANP multiple-use zone	Importance of the MANP for climbing Mount Apo (0=not important; 1=important)	Importance of the MANP as water catcment area and source of safe drinking water (0=not important; 1=important)
Combined sample	Dichotomous-choice bid	---	.	.	.	+++	+++	.	+++
	Open-ended bid	+++	--	.	.	+++	+++	.	+++
Climbers	Dichotomous-choice bid	---	.	.	++	.	+++	.	++
	Open-ended bid	+++	.	.	.	+++	+++	.	++
General public	Dichotomous-choice bid	---	.	.	+++	++	.	.	+
	Open-ended bid	.	--	.	++	+++	.	++	+

[1] dichotomous-choice bid amount

---, --, - negative coefficient, significant at p<0.01, p<0.05, p<0.1 respectively
+++, ++, + positive coefficient, significant at p<0.01, p<0.05, p<0.1 respectively
. variable not found to be significant
n/a variable not included in the model

The chapter is divided into three sections. Section 7.2 describes logit model parameters based on dichotomous choice answers and welfare estimates. Section 7.3 describes Tobit model parameters based on open-ended willingness to pay questions and welfare estimates. Section 7.4 presents the reasons for protest bids.

7.2 Model parameters and welfare estimates from dichotomous choice bids

In the survey, climber and general public respondents were presented with dichotomous-choice bids for climbing Mount Apo. Each respondent was asked to indicate his or her willingness to pay a randomly assigned bid amount in the range of PhP 1000 (AUD 23.5; double the existing climbing fee) to PhP 5500 (AUD 129.41), in PhP 500 increments (AUD 11.76).

Figure 7-1 shows respondents' willingness to accept the dichotomous-choice bids. Consistent with economic theory, the percentage of respondents willing to accept the bids decreased as the bid amount increased. Almost 25% of climber respondents and 20% of general public respondents who were offered the lowest bid of PhP 1000 (AUD 23.53) accepted the bid while only 2% of general public respondents and no climber respondents accepted the highest bid of PhP 5500 (AUD 129.41). In the bid range between PhP 2000 (AUD 47.06) and PhP 3500 (AUD 82.35), relatively more climber respondents accepted the bids.

Table 7-2 shows the logit model parameters and resulting welfare estimates for general public and climber samples, both separately and the combined sample. For all three models, the bid amount was negatively correlated with respondents' willingness to pay for climbing ($p<0.001$), while the respondent's attitude relating to the 'importance of MANP as a water catchment area and source of safe drinking water' was positively correlated with the acceptance of a bid ($p<0.005$ for the combined sample; $p<0.075$ for the general public sub-sample; $p=0.045$ for the climber sub-sample).

Of socio-demographic variables, age and gender were not significantly correlated with respondents' willingness to pay. Monthly income was positively correlated with willingness to pay for the combined sample ($p=0.003$) and the general public sub-sample ($p<0.015$). Geographical distance of location of residence from the MANP was positively correlated with willingness to pay for the combined sample ($p=0.003$) and climber sub-sample ($p=0.001$), indicating a higher willingness to pay for climbers

who lived further away from the MANP. Level of education was positively associated with willingness to pay for general public respondents (p=0.028) and climber respondents (p=0.039).

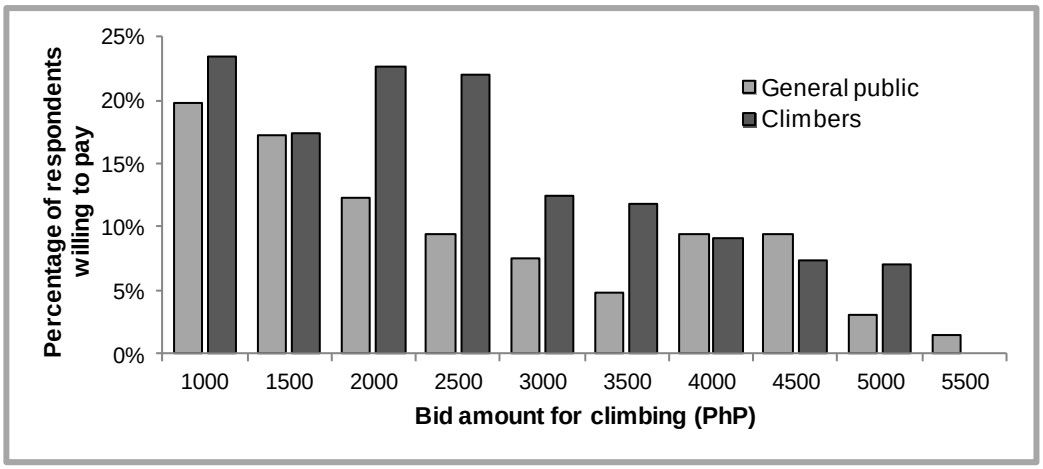


Figure 7-1: Willingness to accept dichotomous-choice bid for climbing Mount Apo, Mindanao, the Philippines, by respondent group

(n = 646 general public, n = 431 climbers)

Willingness to pay was positively influenced by respondents' recognition of the importance of the hydrologic services provided by the MANP. Among general public respondents, higher education and income levels were significant positive variables. For climber respondents, geographical distance of place of residence from Mount Apo had a significant positive influence on the likelihood of bid acceptance.

The chi-square coefficients indicated that all three models were statistically significant at $p<0.001$. McFadden's pseudo R^2 of 0.12 – 0.16 suggested that they had only moderate predictive power.

The resulting welfare estimates from dichotomous-choice bids showed that, on average, general public respondents were willing to pay PhP 1263 (AUD 29.72) to climb Mount Apo, while climber respondents were willing to pay PhP 756 (AUD 17.80). T-test revealed statistically significant difference ($p<0.001$) between the mean willingness to pay of general public respondents and climber respondents.

Table 7-2: Logit model parameters of respondents' willingness to accept payment bid for climbing Mount Apo and resulting welfare estimates, Mindanao, the Philippines, by respondent group

	Joint general public and climbers		General public		Climbers	
Variable	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Constant	-3.556 ***	0.932	-3.993 ***	1.233	-2.330 *	1.340
Bid amount (PhP)	-0.442 ***	0.078	-0.453 ***	0.107	-0.447 ***	0.118
Age (category)[a/]	-0.077	0.107	-0.210	0.138	0.347	0.213
Gender (0=male; 1=female)	-0.161	0.214	-0.413	0.284	0.197	0.349
Highest level of educational attainment (category)[b/]	0.101	0.098	0.274 **	0.125	-0.357 **	0.173
Monthly personal income before taxes (category)[c/]	0.104 ***	0.035	0.125 **	0.051	0.077	0.051
Place of residence: Outside the MANP multiple-use zones	0.711 ***	0.239	0.826	0.562	1.135 ***	0.338
'Importance of MANP for climbing Mount Apo' (0=not important; 1=important)	0.050	0.090	0.090	0.115	0.111	0.164
'Importance of MANP as water catchment area and source of safe drinking water' (0=not important; 1=important)	0.354 ***	0.126	0.312 *	0.176	0.376 **	0.188
Model fit:						
Number of observations	1077		646		431	
Log likelihood	-322.89		-177.34		-136.99	
McFadden pseudo R^2	0.12		0.12		0.16	
Chi-square$_{df=8}$	86.00 ***		49.27 ***		51.29 ***	
Welfare estimates (PhP)						
Mean WTP	910.09		1263.18		756.44	
Median WTP	905.89		1239.30		742.49	
WTP confidence interval (95%)	734.78 - 1105.41		826.49 - 1896.36		534.73 - 1047.54	

***, **, * significant at p<0.01, p<0.05, p<0.1 respectively

[a/] 1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/] 1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/] 1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

7.3 Willingness to pay based on open-ended bids for climbing Mount Apo

Following the dichotomous-choice question in the survey, respondents were asked to nominate the maximum amount that they were willing to pay to climb Mount Apo. Figure 7-2 shows the maximum fee that respondents were willing to pay. The majority of respondents were willing to pay PhP 500 (AUD 11.76) or less to climb Mount Apo. Almost one-third of climber respondents offered to pay a climbing fee of PhP 1000 (AUD 23.53) or above, while only 25% of general public respondents were willing to pay the same amount. Only 1% of respondents offered to pay a PhP 5000 (AUD 117.65) climbing fee per person. The demand curve, thus, is consistent with economic theory.

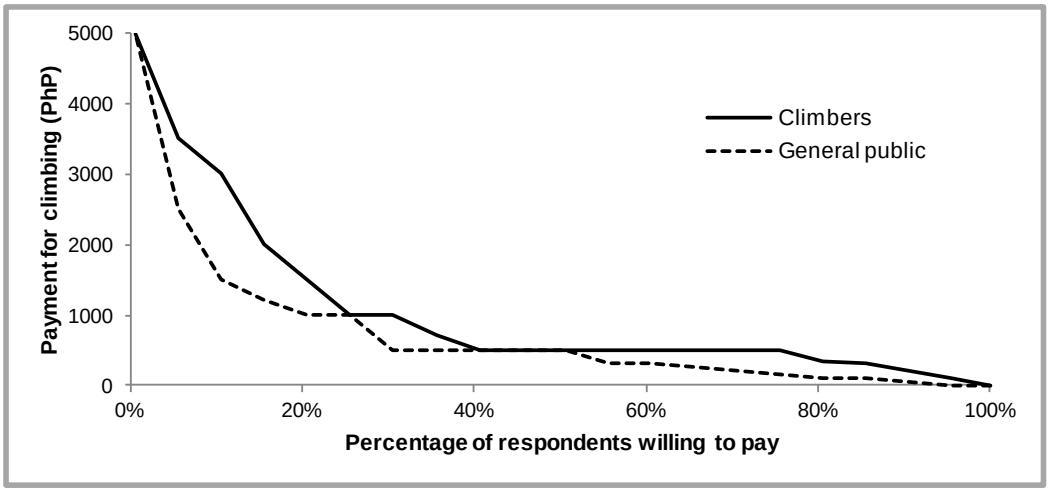


Figure 7-2: Willingness to pay curve from respondents' open-ended for climbing Mount Apo, Mindanao, the Philippines, by respondent group

(n = 646 general public, 431 climbers)

Table 7-3 shows the factors that were associated with the nominated willingness to pay amounts from open-ended bids and the resulting welfare estimates. Across all Tobit models, significant positive correlations were found between willingness to pay and income ($p<0.001$ for combined sample and climber sub-samples; $p=0.009$ for general public sub-sample), as well as willingness to pay and recognising the 'importance of the MANP as water catchment area and source of safe drinking water'

(p=0.001 for the combined sample; p=0.008 for the general public sub-sample; p=0.015 for the climber sub-sample). Age was negatively associated with willingness to pay for the combined sample (p=0.029) only. Education was positively associated with willingness to pay for general public respondents (p=0.008). Willingness to pay was positively associated with residence outside the MANP for the combined sample and for climber respondents (p<0.001).

The dichotomous-choice bid amount was positively correlated with the stated willingness to pay amount for the combined sample (p<0.001) and climber sub-sample (p=0.002). The results indicate the presence of anchoring bias.

Respondents with higher incomes and those who recognised the importance of the hydrological services provided by the MANP tended to be willing to pay a higher fee to climb Mount Apo. Among general public respondents, those who were younger and had higher levels of formal education were willing to pay more than older and less educated respondents. Among climber respondents, those who lived further away from the MANP were willing to pay more to climb Mount Apo compared to respondents who lived within and around the MANP multiple use zone.

The mean stated willingness to pay amount to climb Mount Apo for general public respondents was PhP 817 (AUD 19.22) per person and for climber respondents PhP 1203 (AUD 2.30) per person. T-test revealed statistically significant difference (p<0.001) between the mean willingness to pay of general public respondents and climber respondents.

Figure 7-3 shows the Tobit-estimated willingness to pay curve for climbing Mount Apo. The Tobit models were censored at a minimum climbing fee of PhP 500 (AUD 11.76), which was the climbing fee in place when the survey was conducted. Climber respondents tended to state higher willingness to pay amounts than general public respondents.

7.4 Reasons for protest bids

Of climber respondents, two provided a protest bid by saying they were not willing to pay any fee to climb Mount Apo again. Both respondents paid the required fee[19], but stated that Mount Apo was a ‘gift from God’, and therefore people should not have to pay to climb the mountain. There was no protest bid from general public respondents.

[19] Climbers who paid the required climbing fee were issued with an identification card.

Table 7-3: Tobit model parameters based on the maximum amount that respondents were willing to pay for climbing Mount Apo and resulting welfare estimates, Mindanao, the Philippines, by respondent group

	Joint general public and climbers		General public		Climbers	
Variable	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Constant	-0.418	0.264	-0.540 *	0.304	0.001	0.500
Bid amount (PhP)	0.074 ***	0.022	0.042	0.026	0.123 ***	0.039
Age (category)[a/]	-0.068 **	0.031	-0.048	0.032	-0.043	0.085
Gender (0=male; 1=female)	-0.044	0.065	-0.099	0.075	0.029	0.125
Highest level of educational attainment (category)[b/]	0.043	0.028	0.082 ***	0.031	-0.046	0.062
Monthly personal income before taxes (category)[c/]	0.065 ***	0.012	0.041 ***	0.015	0.083 ***	0.020
Place of residence: Outside the MANP multiple-use zones	0.522 ***	0.086	0.304	0.202	0.534 ***	0.117
'Importance of MANP for climbing Mount Apo' (0=not important; 1=important)	0.039	0.027	0.063 **	0.030	-0.029	0.055
'Importance of MANP as water catchment area and source of safe drinking water' (0=not important; 1=important)	0.112 ***	0.033	0.105 ***	0.040	0.143 **	0.059
Disturbance standard deviation						
Sigma	1.042 ***	0.023	0.933 ***	0.027	1.166 ***	0.040
Model statistics						
Number of observations	1077		646		431	
Log likelihood	-1554.17		-858.28		-676.70	
Welfare estimates (PhP)						
Mean WTP	976.72		817.03		1202.96	
Median WTP	899.43		792.31		1202.96	
WTP confidence interval (95%)	525.53 - 1825.87		471.13 - 1271.24		624.89 - 2098.08	

***, **, * significant at p<0.01, p<0.05, p<0.1 respectively

[a/] 1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/] 1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/] 1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

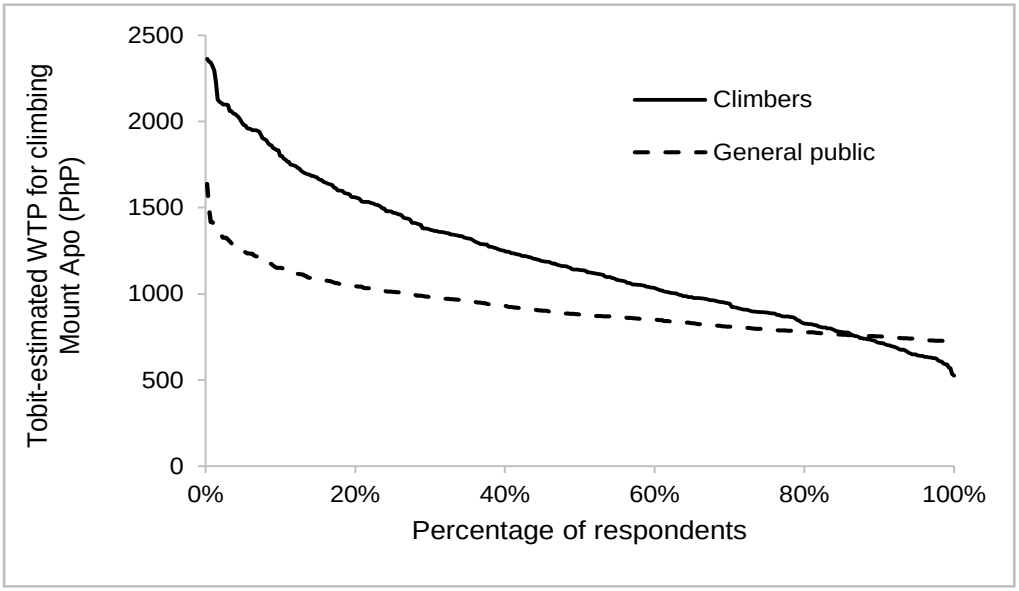


Figure 7-3: Tobit-estimated willingness to pay curve for climbing Mount Apo, Mindanao, the Philippines, by respondent group

(n = 646 general public, 431 climbers)

8 Willingness to pay for biodiversity conservation

8.1 Chapter synopsis

This chapter presents the analysis of general public respondents' willingness to pay for biodiversity conservation in the MANP. Table 8-1 gives a summary overview of factors that were found to significantly influence general public respondents' willingness to pay, for both of the models that were estimated.

Table 8-1: Overview of variables that significantly influenced general respondents' willingness to pay for biodiversity conservation in the Mount Apo Natural Park, Mindanao, the Philippines, by WTP elicitation format

(n=646)

	WTP elicitation format	
Explantory variable	Dichotomous-choice bids	Open-ended bids
Bid amount (PhP)[1]	---	++
Age (category)	.	---
Gender (0=male; 1=female)	.	.
Education (category)	.	.
Income (category)	.	+++
Residence: Magpet	++	+++
Residence: Davao City	+++	+++
Awareness of MANP as home to some rare plants and animals (0=no; 1=yes)	+	++
Importance of MANP as a place where some rare plants and animals live (0=no; 1=yes)	++	+++

[1] dichotomous-choice bid amount

--- negative coefficient, significant at p<0.01

+++, ++, + positive coefficient, significant at p<0.01, p<0.05, p<0.1 respectively

. variable not found to be significant

n/a variable not included in the model

Sections 8.2 and 8.3 describe the model parameters and resulting welfare estimates for the dichotomous and open-ended choice questions, respectively. Section 8.4 reveals the reasons why some respondents were unwilling to pay for biodiversity conservation in the MANP.

8.2 Willingness to accept a dichotomous-choice bid for biodiversity conservation: model parameters and welfare estimates

In the survey, general public respondents were presented with dichotomous-choice bids for biodiversity conservation payments. Each respondent was asked to indicate his or her willingness to pay the bid amount. Figure 8-1 shows the respondents' willingness to accept the bids. In general, the percentage of respondents who accepted the bid decreased as the bid amount increased.

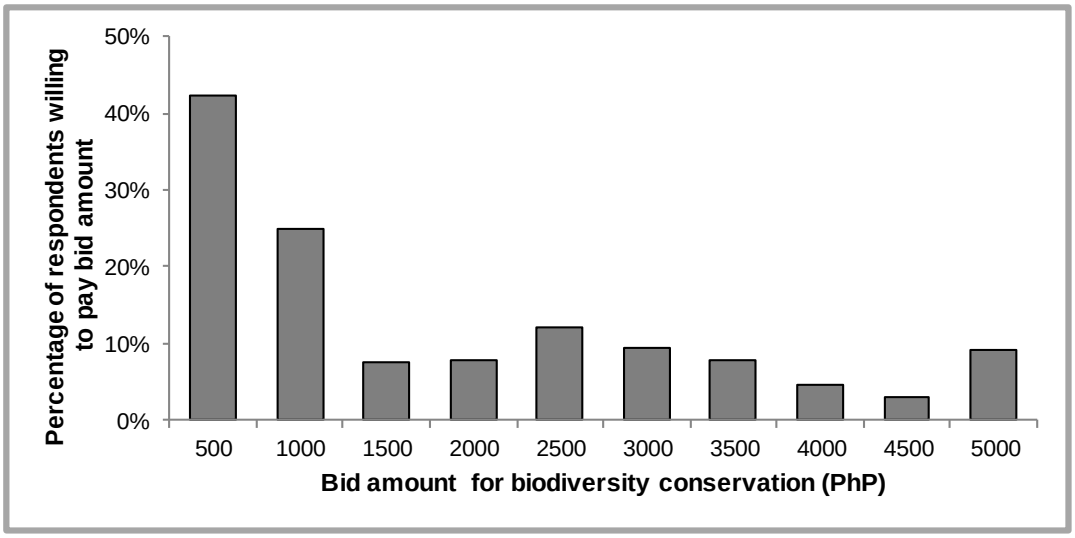


Figure 8-1: General public respondents' willingness to accept dichotomous-choice bids for biodiversity conservation in the Mount Apo Natural Park, Mindanao, the Philippines

(n = 646)

Table 8-2 shows the logit model and resulting welfare estimates from dichotomous-choice bids. There was a negative correlation between bid acceptance and bid amount ($p<0.001$). Residents of Magpet and Davao City were willing to pay more for biodiversity conservation than respondents from elsewhere ($p=0.013$ and $p<0.001$, respectively). Willingness to pay was positively corrected with the importance that

respondents attributed to the biodiversity conservation function of the MANP (p=0.018).

The logistic regression model was significant at p<0.001 and had moderate predictive power. The welfare estimates indicated that, on average, general public respondents were willing to make a one-off payment of PhP 670 (AUD 15.76) to support biodiversity conservation in the MANP.

Table 8-2: Logit model parameters of general public respondents' willingness to accept one-off bids and resulting welfare estimates for biodiversity conservation in the Mount Apo Natural Park, Mindanao, the Philippines

Variable	Coefficient	Std. Error
Constant	-4.006 ***	1.123
Bid amount (PhP)	-0.635 ***	0.102
Age (category)[a/]	-0.160	0.117
Gender (0=male; 1=female)	0.203	0.260
Highest level of educational attainment (category)[b/]	0.141	0.114
Monthly personal income before taxes (category)[c/]	0.064	0.048
Place of residence: Magpet	1.218 **	0.492
Place of residence: Davao City	1.206 ***	0.296
Awareness about MANP as home to some rare plants and animals (0=not aware; 1=aware)	0.839	0.521
Importance of MANP as a place where some rare plants and animals live (0=not important; 1=important)	0.326 **	0.138
Model fit:		
Number of observations	646	
Log likelihood	-208.82	
McFadden pseudo R^2	0.16	
Chi-square$_{df=9}$	81.65 ***	
Welfare estimates (PhP)		
Mean WTP	669.68	
Median WTP	666.49	
WTP confidence interval (95%)	529.56 - 832.88	

***, **, * significant at p<0.01, p<0.05, p<0.1 respectively

[a/]1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/]1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/]1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

8.3 Open-ended willingness to pay bids for biodiversity conservation: model parameters and welfare estimates

Following the dichotomous-choice question in the survey, general public respondents were asked to nominate the maximum amount that they were willing to pay per year for biodiversity conservation in the MANP. As Figure 8-2 shows, approximately 20% of respondents were willing to pay at least PhP 100 (AUD 2.35) and only 5% of respondents were willing to pay more than PhP 2500 (AUD 58.82). In contrast, 10% of respondents indicated that they were not willing to pay any amount to support biodiversity conservation in the MANP, consistent with the protest bids in the dichotomous choice question.

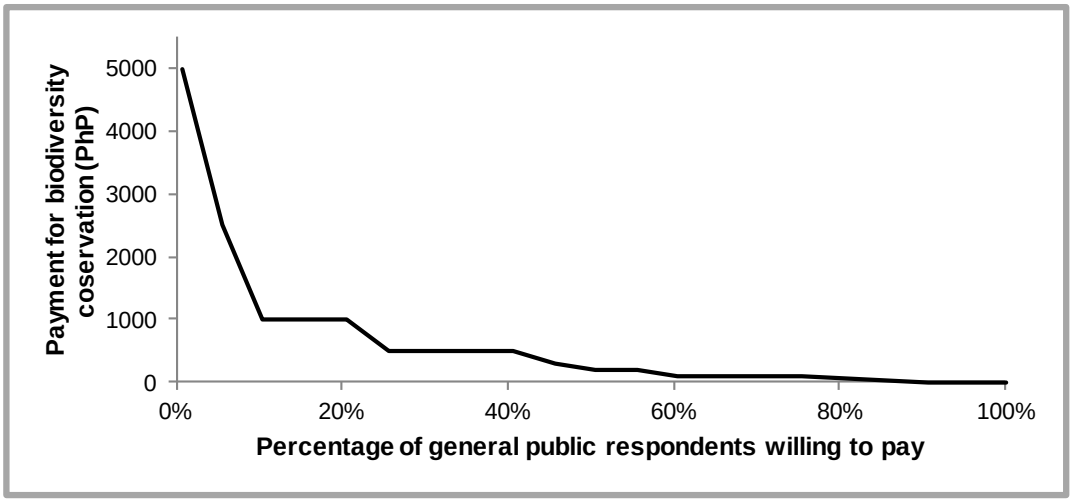


Figure 8-2: Willingness to pay curve from general public respondents' open-ended bids for biodiversity conservation in the Mount Apo Natural Park, Mindanao, the Philippines

(n=646)

Table 8-3 shows the factors that were associated with nominated willingness to pay amounts from open-ended bids and the resulting welfare estimates. Younger respondents tended to be willing to pay a higher amount (p=0.005), as were respondents residing in either Magpet (p<0.001) or Davao City (p<0.001) and those on higher incomes (p=0.001). Respondents who showed awareness of the rarity of biodiversity in the MANP were willing to pay more to support biodiversity conservation (p=0.029), as were those who attributed higher importance to the biodiversity conservation function of the MANP (p=0.004). There was a significant

positive correlation between the bid amount and nominated willingness to pay amount (p=0.029), which indicates an anchoring bias.

Table 8-3: Tobit model parameters of the maximum amount that general public respondents would be willing to pay and resulting welfare estimates for biodiversity conservation in the Mount Apo Natural Park, Mindanao, the Philippines

Variable	Coefficient	Std. Error
Constant	-0.542 *	0.327
Bid amount (PhP)	0.062 **	0.028
Age (category)[a/]	-0.101 ***	0.036
Gender (0=male; 1=female)	0.042	0.083
Highest level of educational attainment (category)[b/]	-0.003	0.035
Monthly personal income before taxes (category)[c/]	0.055 ***	0.017
Place of residence: Magpet	0.578 ***	0.159
Place of residence: Davao City	0.506 ***	0.091
Awareness about MANP as home to some rare plants and animals (0=not aware; 1=aware)	0.324 **	0.148
Importance of MANP as a place where some rare plants and animals live (0=not important; 1=important)	0.115 ***	0.040
Disturbance standard deviation		
Sigma	1.02 ***	0.030
Model statistics		
Number of observations	646	
Log likelihood	-890.23	
Welfare estimates (PhP)		
Mean WTP	739.92	
Median WTP	713.91	
WTP confidence interval (95%)	326.62 - 1283.67	

***, **, * significant at p<0.01, p<0.05, p<0.1 respectively

[a/]1=15 years old and below; 2=16-25 years old; 3=26-35 years old; 4=36-45 years old; 5=46-55 years old; 6=56-65 years old; 7=66 years and older

[b/]1=no formal schooling; 2=some elementary; 3=elementary graduate; 4=some high school; 5=high school graduate; 6=some college; 7=vocational; 8=college graduate; 9=post graduate

[c/]1=below PhP3,333; 2=PhP3,333-PhP4,999; 3=PhP5,000-PhP6,666; 4=PhP6,667-PhP8,332; 5=PhP8,333-PhP10,332; 6=PhP10,333-PhP13,332; 7=PhP13,333-PhP17,832; 8=PhP15,833-PhP18,332; 9=PhP18,333-PhP20,832; 10=PhP20,833-PhP23,332; 11=PhP23,333-PhP25,832; 12=PhP25,833 and above

The model was significant at p<0.001. Welfare estimates from the open-ended bids indicated that, on average, general public respondents were willing to pay a

maximum of PhP740 (AUD 17.41) per person for biodiversity conservation in the MANP.

Figure 8-3 shows the Tobit-estimated general public respondents' willingness to pay curve for biodiversity conservation in the MANP. The estimated willingness to pay amounts ranged from PhP 230 to PhP 1350 (AUD 5.41 to 31.76), with a median value of about PhP 700 (AUD 16.47). According to the model, 15% of respondents were willing to pay at least PhP 1000 (AUD 23.53).

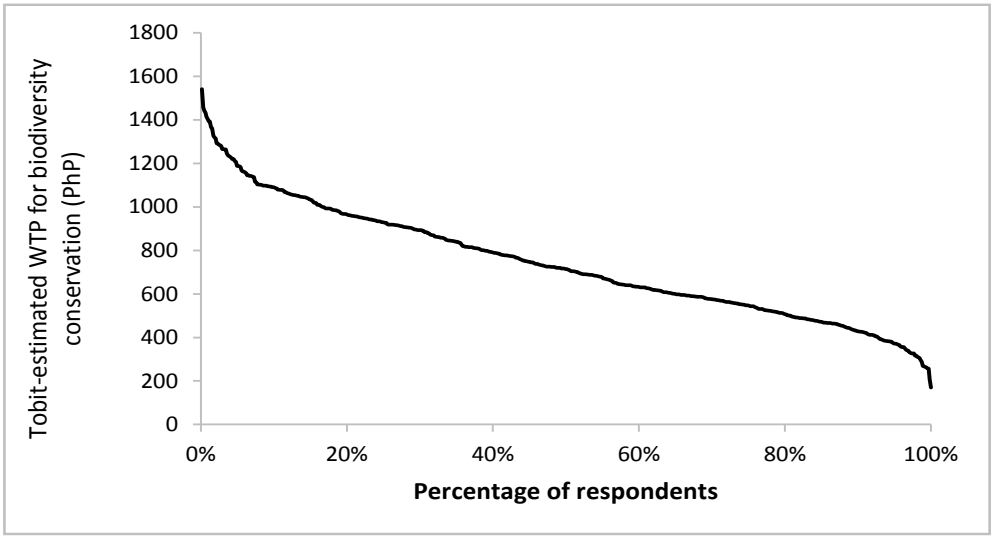


Figure 8-3: Tobit-estimated willingness to pay curve of general public respondents for biodiversity conservation in the Mount Apo Natural Park, Mindanao, the Philippines

(n=646)

8.4 Reasons for protest bids

Sixty-three general public respondents (10%) indicated zero as the maximum amount that they were willing to pay for biodiversity conservation in MNAP. A supplementary question sought to explore the reason(s) for these protest bids. Figure 8-4 shows protest bidders' level of agreement or disagreement with "reason" statements. Almost 75% thought that the government was responsible for financing biodiversity conservation. Lack of trust in the organisation that would manage the funds and income distribution issues were lesser concerns for protest bidders.

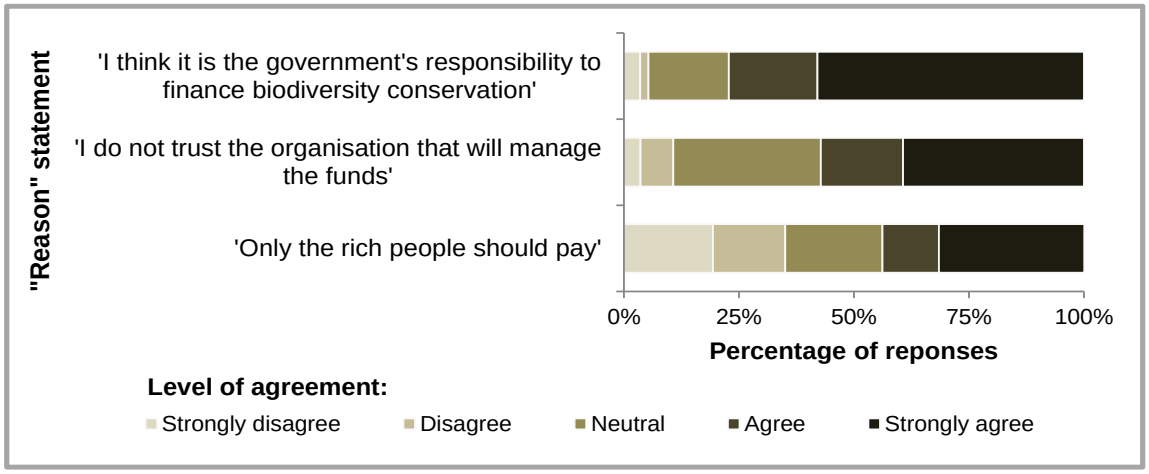


Figure 8-4: General public respondents' agreement with reason statements for protest bids for biodiversity conservation in the Mount Apo Natural Park, Mindanao, the Philippines

(n = 63)

9 Total economic value of the Mount Apo Natural Park

9.1 Chapter synopsis

This chapter integrates the results of the preceding chapters by presenting TEV estimates of the ecosystem services provided by the MANP. The TEV of the MANP was estimated to be approximately PhP 6482.3 million (AUD 152.52 million). This estimate represents a lower bound as (1) only a subset of components of the TEV can be estimated; and (2) it can be estimated only for certain groups of beneficiaries, namely household water users, mountain climbers and the general public living adjacent to the MANP. Nonetheless, the chapter provides an attempt to go beyond the abstract notion of total economic value by providing a quantitative value estimate of the ecosystem services provided by the MANP.

9.2 Components of total economic value

As indicated in Chapter 4 (Section 4.7), this research focuses on the following TEV components of the MANP: use values associated with water provision and climbing, option and non-use values of watershed protection, option value of climbing and non-use value (bequest and/or existence) of biodiversity.

The use values represent the direct and indirect benefits to users of the resources, including the household water users who benefited from the water provision services of the MANP and climbers who benefited from the recreational opportunities provided by the MANP. The option value of water provision represented the value of safeguarding water quality and quantity from watershed areas within the MANP for future use, while the option value of climbing represented the value that the general public attributed to the opportunity to climb Mount Apo in the future. Finally, the non-use value of biodiversity represented the value to the general public of protecting the rare plants and animals that live in the MANP for current and future generations.

9.3 Total economic value estimate

The TEV estimate is the total of the estimated values of ecosystem services provided by the MANP. The value of each ecosystem service was derived by extrapolating to the population the consumer surplus for each ecosystem service. Table 9-1 summarises the consumer surplus of each ecosystem service included in the study, as well as their application in the estimation of TEV. Other variables that were utilised in the estimation of TEV are listed in Table 9-2.

Table 9-1: Consumer surplus for ecosystem services provided by the Mount Apo Natural Park, Mindanao, the Philippines

Variable	Consumer surplus per user (PhP)	TEV component where applied	Respondent source of data
Mean WTP for monthly payment for watershed protection	41 per household	Use value - water provision	Household water users
Net WTP for climbing[1/]	606 per climber	Use value - climbing	Climbers
Mean WTP one-off payment for watershed protection	439 per household	Option value - water provision	General public
Mean WTP for climbing	817 per person	Option value - climbing	General public
Mean WTP for biodiversity conservation	740 per person	Non-use value - biodiversity	General public

[1/]Tobit-estimated mean WTP for climbing less average actual climbing fee paid

The estimation of the use value of water provision comprised five steps: (1) a proportion of the monthly household water bill (20%) was attributed to watershed protection—the majority of the bill was assumed to be related to water infrastructure and delivery; (2) the monthly consumer surplus of PhP 41 (AUD 0.96) per household was added to the base amount; (3) the combined amount was multiplied by 12 to derive the annual value per household; (4) the annual value was multiplied by the total number of households in the periphery of the MANP, which were assumed to be supplied by the utility; and (5) future annual values were converted to net present value, and then summed.

Some large privately-owned water utilities in the Philippines allocate funding to watershed protection that is equivalent to about 10% of their gross income (Villamor et al. 2007). This research assumes that 20% of household water bill is allocated for watershed protection considering the poor state of watershed areas within the MANP.

Total number of households in the periphery of the of the MANP is considered in the estimation of TEV based on the hydrologic map of the MANP (Figure 3-5) which shows that watersheds drain to areas beyond the boundary of the natural park.

The recreation value of natural sites is commonly estimated using consumer surplus (Croitoru 2007; Ninan & Inoue 2013; Rolfe 2010; Rolfe & Dyack 2011). Actual payments or travel costs can be utilised in estimation of recreation value when consumer surplus is not available (Croitoru 2007). In the case of Mount Apo, the climbing fee represents only 10% of average total climbing-related expenses. This implies that the consumer surplus, which is based solely on willingness to pay amount for climbing does not realistically capture the true value of climbing. Thus, the use value of climbing was estimated in three steps: (1) the consumer surplus for climbing was added to the climbing-related expenses of climber respondents; (2) the sum of the consumer surplus and climbing-related expenses was multiplied by the annual number of climbers; and (3) the resulting annual estimates for future years were converted to net present value and summed.

The use values were converted to net present value to make them comparable and additive to option and non-use values which were lump-sum payments. Net present value was estimated using the population growth rate, annual inflation rate and the discount rate shown in Table 9-2. The population growth rate was the 10-year annual average from 2000 to 2010 for administrative regions that cover the MANP (Regions 11 and 12), while the inflation rate was the 10-year annual national average from 2000 to 2010, and the discount rate was derived from the 10-year annual national average of bank interest rates from 2000 to 2010.

The discount rate applied to the valuation of ecosystem services used in other studies has varied from 5% in the Amazon forest (Torras 2000) to 15% in a river basin in China (Zhongmin et al. 2003); for other discount rates applied to ecosystem service valuation see Chopra (1993), Nahuelhual et al. (2007), Turner et al. (2003), and studies summarised by Torras (2000). This study applied a 12% discount rate and 15-year time span to ensure consistency with the values used in an earlier study in the Philippines (Francisco 2004).

Table 9-2: Other data utilised in estimating total economic value of the Mount Apo Natural Park, Mindanao, the Philippines

		Use value		Option value		Non-use value
Variable	**Value**	**Water provision**	**Climbing**	**Water provision**	**Climbing**	**Biodiversity**
Portion of average monthly water bill allocated for watershed protection (PhP), assumed to be 20%	47	✓				
Average total climbing-related expenses incurred by climber respondents less climbing fee (PhP)	4,275		✓			
Total number of households in the periphery of the MANP, 2010 data	437,433	✓		✓		✓
Total population in the periphery of the MANP who were at least 15 years old, 2010 data	1,984,914				✓	
Number of climbers per year	3,500		✓			
Percentage (%) of climbers who resided adjacent to the MANP	57				✓	
For NPV calculation:						
Annual population growth rate (%)	2	✓	✓			
Annual inflation rate (%)	5	✓	✓			
Discount rate (%)	12	✓	✓			

The option value of watershed provision was estimated by multiplying the consumer surplus (PhP 439 = AUD 10.33) with the total number of households. The non-use value of biodiversity was estimated by multiplying consumer surplus (PhP 740 = AUD 17.41) by the total number of households. For the estimation of the option value of water provision and non-use value of biodiversity, it was assumed that the respondent was a representative of a household. Finally, the option value of climbing was estimated by multiplying the consumer surplus (PhP 817 = AUD 19.22) with the 57% of the population that are at least 15 years old; it was assumed that younger individuals would not climb Mount Apo.

Table 9-3 shows a summary of TEV estimates for the ecosystem services provided by the MANP. The values represent a net present value for the year 2010 with future benefit streams having been discounted at a rate of 12% per annum. Discounting was necessary because the value of future benefits is less than that of present benefits (Torras 2000) and the application of an appropriate discount rate allows for

the comparison of values derived from annual payments and a lump sum or one-off payment (Zhongmin et al. 2003).

Table 9-3: Lower bound estimate of total economic value of ecosystem services provided by the Mount Apo Natural Park, Mindanao, the Philippines

(net present value for year 2010)

Component	Net present value (PhP million)	Percentage (%)
Water provision (domestic, use value)	2,458.7	38%
Watershed protection (option + non-use values)	191.8	3%
Climbing (use value)	177.8	3%
Climbing (option value)	608.0	9%
Biodiversity (non-use value)	3,046.1	47%
Total	**6,482.3**	**100%**

Use values made up 41% of the estimated total economic value of the MANP and was accounted for by the ecosystem services from which individuals and households derived direct benefits. The importance of the MANP as a watershed area was demonstrated by the use value of water provision for domestic use, which accounted for more than one-third of the estimated total economic value of the MANP. The use value of recreation and option value of watershed protection contributed the least to the total economic value of the MANP. Option and non-use values accounted for 59% of the estimated total economic value of the MANP.

10 Discussion

10.1 Chapter synopsis

This chapter reviews the research methodology and discusses the implications of the research results for the potential application of PES mechanisms in management of the MANP. The chapter is divided into four sections. Section 10.2 analyses the strengths and limitations of the methodology, Section 10.3 discusses the use and non-use values of the MANP, and Section 10.4 discusses the design of potential PES mechanisms.

10.2 Strengths and limitations of the methodology

Economic valuation is the principal method applied in this research. Economic valuation helps increase awareness about the benefits from ecosystem services (Smith, de Groot & Bergkamp 2006) and helps overcome the lack of knowledge about economic value which may lead to the depletion of ecosystem services (Ojea, Martin-Ortega & Chiabai 2012). While there are questions as to the ethical appropriateness of monetary valuation of ecosystem services (e.g., Luck et al. 2012), economic valuation provides an important foundation in developing payment schemes for ecosystem services (Smith, de Groot & Bergkamp 2006). It is not always necessary to undertake extensive economic valuation of all ecosystem services and land-use alternatives when designing PES mechanisms (Wunder, S. 2007), but estimates of the monetary amount users are willing to pay for ecosystem services provide a critical indication of the feasibility of PES schemes (Whittington & Pagiola 2012).

This research utilises contingent valuation, which has been the predominant approach in valuation studies conducted in the context of designing PES programs (Whittington & Pagiola 2012). The research focuses on the economic valuation of watershed protection, mountain climbing and biodiversity conservation. The application of contingent valuation in the estimation of the economic value of these ecosystem services provides a common and comparable monetary unit that is an important support tool for policy-making (Brauman et al. 2007; Morse-Jones et al. 2011; Viglizzo et al. 2012).

One strength of contingent valuation is its applicability in the estimation of both use values and non-use values of ecosystem services (Jones-Walters & Mulder 2009; Moran 1994), including option value (Carson, Flores & Meade 2001). In the context of this research, all three types of values are included in the estimation of a lower-bound total economic value of the MANP. A limitation of the contingent valuation technique is its susceptibility to potential biases that result in either underestimation or overestimation of the true value of the relevant ecosystem service. For this research, it is possible that value estimates are affected by survey respondents' hypothetical bias, anchoring bias, the warm glow effect and strategic bias (a detailed description is presented in Chapter 4). Biases are minimised in the design of survey instruments, sampling procedure and data collection.

For watershed protection and climbing, the possibility of hypothetical bias was minimised by drawing sample respondents from a population of actual and potential users of the ecosystem services being valued. Household water users and climbers are confronted by actual payments and are, therefore, personally aware of the relevance of valuing ecosystem services. The challenge is in minimising the hypothetical bias in the valuation of biodiversity conservation, wherein it is possible that respondents may have given values that do not reflect their true valuation because they believed that they are not really going to pay anyway. In an attempt to minimise hypothetical bias for biodiversity conservation, the term "rare plants and animals" is used in the survey instrument rather than "biodiversity". The data collection method may have minimised both hypothetical and strategic biases. However, there is no basis to determine the extent of either hypothetical bias or strategic bias in the valuation estimates. Results of logit and Tobit regression indicate the presence of anchoring bias in the acceptance of dichotomous-choice bids and in the maximum amount that respondents were willing to pay for all three ecosystem services.

This research was conducted to provide a clear understanding of the types of ecosystem services provided by the MANP, and the monetary value these ecosystem services represented to users and beneficiaries. This understanding provides the foundation for an evidence-based discussion about the potential for PES-style arrangements, and the potential design for such arrangements. Thus, the focus of the surveys was on the valuation of the various ecosystem services provided by the MANP. While the payment vehicle was not specified in the surveys, household water respondents and climber respondents could have inferred how payment would be made. Based on how the valuation questions were phrased, that is, that the payment would be top-up to their monthly household bill, household respondents would have

believed that additional payment would be made to the water utility. For climber respondents, the surveys were conducted at the local tourism offices after they had completed all required procedures for climbing. Thus, it was likely they had inferred that additional payment would be made to the same tourism offices.

The general public respondents were probably the least informed as to where payment would be made. However, the absence of specification for payment vehicle does not discount the relevance of the results of this research. Of more relevance is the fact the results show that general public respondents are “in the market” as evidenced by high percentage of respondents who were willing to pay.

Cummings et al. (1997) shows that incentive-compatibility not necessarily true in valuation of environmental resources through contingent valuation. The presence of incentive-compatibility and consequentialism among respondents as they examined and responded to the WTP questions could have been minimised by the absence of detailed management plan in the contingent valuation scenario and the conduct of surveys through in-person interviews. It is acknowledged that no test was carried to determine the extent of incentive-compatibility and consequentialism among respondents.

The presence of protest bids indicates free riding is possible, both for watershed protection and biodiversity conservation. That is, there are people who would wish to benefit from the ecosystem services but unwilling to pay. However, the extent of protest bids is much lower than those found in other areas (García-Llorente, Martín-López & Montes 2011; Meyerhoff & Liebe 2008). The acknowledged limitations in the contingent valuation method applied in this research do not discount the relevance of the results in exploring the potential of designing PES schemes for the MANP. This research satisfied seven of the nine “indicators of good practice in contingent valuation applications in the PES field” identified by Whittington & Pagiola (2012).

10.2.1 Elicitation format for willingness to pay

The single-bound dichotomous-choice elicitation format is the most commonly used elicitation format in contingent valuation studies (Calderon et al. 2013; De Faria et al. 2007; Raje, Dhobe & Deshpande 2002). This research utilises what is referred to as an anchored open-ended format, whereby respondents are initially offered a single-bound dichotomous-choice bid, followed by an open-ended question on their maximum willingness to pay amount, regardless of the answer to the preceding bid (De Faria et al. 2007; Ojeda, Mayer & Solomon 2008).

The anchored open-ended format allows respondents to state their maximum willingness to pay outside of the confines of dichotomous-choice bids (De Faria et al. 2007; Del Saz-Salazar, Hernández-Sancho & Sala-Garrido 2009). This elicitation format is not completely free from anchoring bias (O'Conor, Johannession & Johansson 1999; Ready, Buzby & Hu 1996) but minimises starting-point bias associated with the bidding game format (Frew, Wolstenholme & Whynes 2004; Ojeda, Mayer & Solomon 2008). The anchored open-ended format is more efficient than single-bound or double-bound dichotomous-choice elicitation formats (De Faria et al. 2007), and therefore results in more reliable estimates of willingness to pay amount for the same number of respondents.

10.2.2 Willingness to pay estimation

Willingness to pay for watershed protection, climbing and biodiversity conservation were estimated through logit models (for dichotomous-choice bids) and Tobit models (for anchored open-ended bids). Resulting model estimates generally have sound parameters that conform to economic theory, and are therefore theoretically valid. Specific indicators of theoretical validity are negative relationships between bid amount and willingness to pay estimates (Carson, Flores & Meade 2001; Loomis, et al. 2000). These conditions were satisfied by willingness to pay estimates from dichotomous-choice bids and anchored open-ended bids for all three ecosystem services.

Other indicators of credible contingent valuation estimates are rejection of the highest bid by at least 90% of respondents (Whittington 1998) and a positive relationship between income and willingness to pay estimates (Whittington & Pagiola 2012). For one-off payment of watershed protection, the highest bid was rejected by less than 90% of water user and general public respondents; perhaps due to their recognition of the importance of water, which they directly use. This is in line with previous research that indicates that direct users of ecosystem services are usually willing to pay more for those services (Carson, Flores & Meade 2001). It is also possible that the highest bid was “too low” to be rejected by at least 90% of respondents.

A positive correlation between income and willingness to pay is considered to be an indicator of good practice in contingent valuation application for PES schemes (Whittington & Pagiola 2012). Model estimates show positive correlations between income and willingness to pay from both dichotomous choice-bids and anchored open-ended bids. Income has a significant influence on all willingness to pay estimates from anchored open-ended bids. However, based on dichotomous-choice

bids, incomes do not have a significant influence on climbers' willingness to pay for climbing nor on the general public's willingness to pay for biodiversity conservation. This suggests that willingness to pay for these ecosystem goods is not significantly different across income levels (Shultz & Soliz 2007).

The generally positive influence of income on willingness to pay for ecosystem services has been observed in earlier studies related to watershed services, nature tourism and biodiversity conservation. Previous contingent valuation studies have shown that willingness to pay for improved watershed services and surface water quality are significantly influenced by household income (Amponin et al. 2007; Calderon et al. 2013; Calderon et al. 2006; Choe, Whittington & Lauria 1996). Household income appears to have had a significantly positive influence on willingness to pay for environmental services sustained by water flows of a river delta (Ojeda, Mayer & Solomon 2008) and on willingness to pay for safe drinking water (Vásquez et al. 2009). Income has also been found to have significant positive influence on willingness to pay for improved water quality but no influence on willingness to pay for improved water supply (Akram & Olmstead 2010). Others studies have shown that income did not have a significant influence on willingness to pay for watershed restoration (Shultz & Soliz 2007), on willingness to pay for watershed services (Van Hecken, Bastiaensen & Vásquez 2012), or on willingness to pay for improved water services in (Casey, Kahn & Rivas 2006).

Income also has a generally positive influence on willingness to pay for nature-based tourism. It had significant positive influence on willingness to pay for countryside access in the United Kingdom (Bennett, Tranter & Blaney 2003), on willingness to pay entrance fees to natural attractions in Iceland (Reynisdottir, Song & Agrusa 2008), and on willingness to pay for nature-based recreation in Indonesia (Hakim, Subanti & Tambunan 2011). In a study of the impact of differential fee policy to national parks in Costa Rica, income had significant influence on willingness to pay entrance fee to some but not all parks (Chase et al. 1998). Income did not have a significant influence on tourists' willingness to pay to visit a rainforest in Australia (Greiner & Rolfe 2004), nor on willingness to pay for improvement in tourism services in a nature reserve in Bolivia (Ellingson & Seidl 2007).

Contingent valuation studies in the Philippines have shown that household income had significant positive influence on willingness to pay for conservation of endangered species (Labao et al. 2007), but did not always significantly influence willingness to pay for marine biodiversity conservation. Household income had a significant positive influence on willingness to pay for conservation of coral reefs in northern Philippines (Ahmed et al. 2007), but did not have a significant influence on

willingness to pay for some groups in relation to biodiversity conservation in a marine world heritage site (Subade 2005).

A cross-country study in Asia showed that household income had a significant positive influence on willingness to pay for the conservation of marine turtles (Jin et al. 2010). Personal income had a significant positive influence on willingness to pay to prevent marine species loss in Portugal (Ressurreição et al. 2011), on willingness to pay for the preservation of endangered shrimp species (Stanley 2005) and bird species in the US (Kotchen & Reiling 2000), and on willingness to pay for conservation of a protected area and rainforest in Brazil (Adams et al. 2008). However, income did not have a significant influence on domestic tourists' willingness to pay for conservation of a national nature reserve in China (Han et al. 2011).

Willingness to pay estimates for climbing show that climbers were willing to pay a higher amount (though not significantly higher) than the general public, most of whom had not climbed Mount Apo. The results confirm that valuation was influenced by the personal relevance of a public good (Ajzen, Brown & Rosenthal 1996) and that direct users were usually willing to pay more than those who do not use the environmental good (Carson, Flores & Meade 2001).

10.2.3 Data collection

There are a number of challenges in collecting data that accurately represent the various users of ecosystem services and their values. A major challenge is the geographic size and location of the MANP. The research site covers approximately 55,000 hectares, and travelling to some places can pose security problems for those who are not known in the area. This was addressed by engaging enumerators who are local residents of the cities and municipalities where the surveys are conducted. Engaging enumerators has been applied in other valuation studies conducted in the Philippines and elsewhere (Calderon et al. 2013; Calderon et al. 2006; Hadker et al. 1997; Subade 2005). Another major advantage of engaging local interviewers is their familiarity with local situations.

In the absence of a household database, face-to-face surveys were deemed to be the most logical way of collecting data; mail and telephone surveys were not appropriate. Contingent valuation surveys in developing countries are usually conducted face-to-face (Whittington 1998). This method of data collection is known to ensure a high response rate (Hadker et al. 1997; Nunes 2002) and is more reliable than either mail or telephone surveys (Hoyos & Mariel 2010). For this research, there were two major advantages in using face-to-face surveys. The first was the ability to

secure at least the minimum number of 30 respondents for each bid for the dichotomous-choice bid elicitation format (Whitehead 2006).

The second advantage of using face-to-face surveys was in minimising strategic bias as respondents could readily clarify aspects of the research, specifically those relating to questions associated with willingness to pay. It was emphasised to respondents that the research was not part of any plan to actually impose a fee for watershed protection or biodiversity conservation or to increase the existing climbing fee. It was acknowledged, though, that it may not be possible to completely eliminate strategic bias because household water users and climber respondents were confronted with the reality of paying to benefit from ecosystem services and may therefore have tended to understate their true value.

Despite efforts to adhere to strict stratified random sampling of respondents, there is a possibility that sample bias resulted from various issues. For household water user respondents, the researcher and enumerators were unable to access “high-end” households in gated communities, and some villages were excluded in the survey due to concerns for the personal security of interviewers. For climber respondents, adjustment to the sampling had to be made on temporal stratification as a result of the closure of three (among five) climbing trails during the summer climbing season of April-May 2010 due to threats of forest fires. Maintaining strict stratified random sampling was most challenging among general public respondents because potential respondents were often in a hurry and were reluctant to take the time to participate in the survey.

Nevertheless, the research succeeded in compiling a comprehensive data set by surveying 1715 respondents (646 general public, 638 household water users, and 431 climbers). The data set provides a sufficient basis for the estimation of reliable willingness to pay amount, and other information relevant to the design of a possible PES scheme (Amponin et al. 2007; Balderas Torres et al. 2013b; Baral & Dhungana 2014; Calderon et al. 2013; Calderon et al. 2006; Moreno-Sanchez et al. 2012).

10.2.4 Stakeholder engagement

This research benefited from positive stakeholder engagement, from research design to implementation. While not all stakeholders have sustained their engagement, some stakeholders who can realistically influence policy and decision-making subsequent to the research continue to engage in discussions regarding potential PES mechanisms. The continuing keen interest of the protected area superintendent

and other stakeholders in the relevance of this research presents realistic opportunities for the implementation of proposed PES mechanisms.

10.3 Use and non-use values of the Mount Apo Natural Park

The TEV framework guided the estimation of use and non-use values of the MANP, based on consumer surplus derived from willingness to pay estimates from anchored open-ended bids and other factors that were indicated in Table 9-2. Willingness to pay from anchored open-ended bids are used for two reasons: (i) some valuation models from dichotomous choice-bids have pseudo R^2 less than 0.15, which is considered to be the standard minimum for reliable contingent valuation estimates (Mitchell and Carson 1989, as cited in Oglethorpe & Miliadou 2000), and (ii) income does not have a statistically significant influence on all willingness to pay estimates from dichotomous-choice bids, but has a statistically significant influence on all willingness to pay estimates from anchored open-ended bids.

The lower bound estimate of the TEV of the MANP was PhP 6482.3 million (net present value for the year 2010 being approximately AUD 152.5 million), which translates to an average value of PhP 117,913 per hectare of the MANP (approximately AUD 2774 per hectare). This estimate is consistent with the scientific literature. The TEV estimate for Kanlaon National Park was PhP 64,842 per hectare (the net present value for 2002)[20]. The lower bound estimate for the total use, option and existence values of a seasonal semi-deciduous forest in Brazil was US$708.83 (in 2001 value) (Santos et al. 2001), while the total value of ecosystem services provided by a tropical forest has been estimated to be high as US$2007 per hectare per year (in 1994 value) (Costanza et al. 1997).

The use value of domestic water provision and recreation (climbing) accounted for 41% of the estimated TEV; 59% was accounted for by option and non-use values of watershed protection, climbing, and biodiversity conservation. The values of components of the MANP's TEV supports the idea that societies generally favour ecosystem services that provide direct benefits (Rodríguez et al. 2006). The relatively high option value of biodiversity (47% of TEV) indicates that individuals place high value on ecosystem goods from which they may not directly benefit.

[20] Mount Kanlaon National Park is situated in Negros Island, Philippines; TEV estimate through benefit transfer.

The TEV estimate for the MANP is a lower bound estimate for a number of reasons. First, not all values were measured, and second, the MANP is irreplaceable because Mount Apo has an iconic status as the Philippines' highest mountain. Third, the estimates were based only on the population of the municipalities and cities that cover the MANP, which was roughly 23% of the combined population of Region 11 and Region 12, and only 2% of total Philippine population.

Fourth, the use value for water provision is based on the consumer surplus of household water users only. Direct human consumption of water is comparatively smaller than other uses (Nahuelhual et al. 2007); the agriculture sector accounts for as much as 85% of global water usage (FAO 2002). In the Philippines, it is estimated that the agriculture sector also accounts for about 85% of total demand for water, while the remaining 15% of water demand is shared by the industrial and domestic sectors (World Bank 2004). Domestic users account for about 63% of groundwater consumption and data from water utilities show that households consume about 80% of their water production.

Fifth, the use value of recreation at the MANP is likely to be higher than the estimate included in the TEV, which was based on the consumer surplus for climbing. This is because the economic valuation of other recreation areas within the MANP was not included in this research, such as the value of recreation activities in and around different bodies of water including hot and cold springs and waterfalls.

Finally, the true option and non-use values are likely to exceed the current estimate for several reasons. The option value for climbing may be higher for climbers from areas outside the MANP, including from Manila and other countries. This is because analysis of the climber sub-sample indicates that climbers who reside outside the periphery of the MANP were willing to pay 74% more to climb Mount Apo than climbers living on the periphery of the MANP. This is consistent with other findings that people who travel longer distances are likely willing to pay a higher amount to enter a tourist site (Schroeder & Louviere 1999). A study of tourist visitation to a rainforest in Australia, for example, showed that foreign visitors were willing to pay 64% more than domestic visitors (Greiner & Rolfe 2004).

The option value and non-use value of watershed protection is likely to be higher if other uses and benefits from watershed protection are included in this research. In general, the value of watershed protection in developing countries can be as high as US$400 per hectare per year for water provision for human consumption, US$3600

per hectare per year for biodiversity conservation, and US$260/hectare/year for recreation and tourism (Smith, de Groot & Bergkamp 2006).

The actual option value of biodiversity conservation at the MANP is likely to be higher than the estimate presented here because the beneficiaries extend beyond the geographic area where the resources are located (Chopra 1993; Jin et al. 2010; Stanley 2005). Earlier studies have shown that people who do not directly use or benefit from a certain environment are still willing to pay for conservation of biodiversity. A study on the conservation of Tubbataha Reefs in Palawan (Southern part of the Philippines), for example, showed that people from other islands who did not directly benefit from the reefs were willing to pay more than those who lived nearby (Subade 2005). A contingent valuation study of wetland conservation in Greece also showed that residents who were living farther away were willing to pay a higher amount for the conservation of a biodiversity-rich wetland than those living nearby (Oglethorpe & Miliadou 2000). In addition, US households were willing to pay for the conservation of an endangered shrimp species that were not consumed by humans (Stanley 2005).

The TEV estimate was less than 2% of the combined gross regional domestic product of Regions 11 and 12, the administrative regions that cover the MANP. Any estimated TEV is inevitably less than the total ecosystem value because economic valuation cannot capture every aspect of an ecosystem (Morse-Jones et al. 2011). It should also be noted that sensitivity analysis was not carried out in the estimation of use and non-use values. That is, this research did not consider alternative assumptions which might have resulted in different values. Despite its limitations, TEV estimates are useful in describing the current status of natural resources and possible losses that may be incurred if the resources are not properly managed and conserved (Stoeckl et al. 2011). Thus, showing the value of ecosystems can serve as a powerful incentive for conservation (Balmford et al. 2002).

10.4 Policy implications: design of potential payment for environmental services mechanisms

PES mechanisms are increasingly being adopted as a policy instrument for addressing environmental issues in developing countries (Whittington & Pagiola 2012). The PES concept recognises that there are trade-offs among various land uses and the need for compensation in reconciling conflicting interests (Wunder, S. 2005). Therefore, PES schemes can help supplement insufficient public funding for conservation (Hein, Miller & de Groot 2013; Pirard 2012b).

Willingness to pay estimates from open-ended bids indicate a mean consumer surplus of PhP 41 (AUD 0.96) per household per month for watershed protection, PhP 606 (AUD 14.26) per climber per climb of Mount Apo, and PhP 740 (AUD17.41) per person per year for biodiversity conservation. The mean consumer surplus of household water users was equivalent to 14% of average the monthly water bill, while the mean consumer surplus of climbers is equivalent to 101% of the average climbing fee per person.

The above estimates reveal a potential for establishing explicit PES mechanisms for the conservation and management of the MANP, focusing on watershed protection, mountain climbing and biodiversity conservation. Table 10-1 shows the proposed PES mechanisms for the ecosystem services provided by the MANP that are included in this research

Current payment structures among household water users and climbers to Mount Apo already constitute PES, although this is not made explicit. However, there is no existing payment scheme for biodiversity. The consumer surplus shows scope to increase the revenue base of water utilities, tourism offices and local government offices through increased payments for watershed protection, climbing and biodiversity, respectively. However, it is necessary to explicitly show that the payment or increased payment supports ecosystem function, and that there should be transparency and accountability of all those who will be involved in managing the funds.

10.4.1 Payment for environmental services mechanism for watershed protection

The most common applications of PES schemes are for watershed protection (Kolinjivadi & Sunderland 2012; Kosoy, Corbera & Brown 2008; Muñoz-Piña et al. 2008; Whittington & Pagiola 2012). This is not surprising considering the vital role of water to society and the noticeable decline in quality of watersheds in many regions due to urban development, invasive species, logging, recreation and other activities that diminish the natural capacity of the watershed (Roumasset & Wada 2013). In urbanised regions in developing countries, problems with water supply are caused by interrelated factors, including high population growth rate, lack of investment in water supply infrastructure and depletion of natural resources.

Table 10-1: Proposed payment for environmental services mechanisms for the Mount Apo Natural Park, Mindanao, the Philippines

Ecosystem service	User and/or beneficiary	Payment vehicle	Intermediary	Environmental service provider	Environmental service provided	Form and mode of payment
Water provision	Household water users Other water users	Monthly water bill	Water utility	Upstream farmers Forest dwellers Indigenous peoples	Alternative farming practices Agroforestry Reforestation	Cash, in-kind, technical assistance; periodic payment
Climbing	Climbers	Climbing fee	Municipal/city tourism office	Forest dwellers Indigenous peoples Communities traversed by climbing trail	Trail rehabilitation Trail maintenance	Cash, in-kind, technical assistance; periodic payment
Biodiversity	General public	Community tax	Municipal/city government	Upland farmers Forest dwellers Indigenous peoples	Alternative farming practices Agroforestry Reforestation	Cash, in-kind, technical assistance; periodic payment

In Mindanao, each water utility is assigned a particular watershed to distribute water to their customers; small water utilities are assigned one watershed while large water utilities are assigned multiple watersheds. Water utilities are responsible for the protection and conservation of the watershed areas from where they extract water, the cost of which is subsumed in the operating cost of the water utility. The water bill that water users receive does not indicate the portion of payment that is specifically allocated for protection of water sources. The cost of watershed protection can be less than 1% of a water utility's gross profit, which can be in the form of voluntary assistance for maintenance of water sources (Villamor et al. 2007). In the MANP, a reforestation project can require a PhP13,000 per hectare (AUD 305.88 per hectare) establishment cost and a PhP450 per hectare per year (AUD 10.59 per hectare per year) maintenance cost (Energy Development Corporation 2011).

In a PES scheme for watershed protection, the activities of upstream farmers that may be compensated include the adoption of alternative farming practices, watershed rehabilitation and maintenance (such as agroforestry and reforestation). Alternative farming practices are intended to prevent further damage to the watershed from the use of agriculture-related chemicals, while watershed rehabilitation and maintenance will improve forest cover and prevent soil erosion. The amount and mode of payment will have to be negotiated between the water utility and the service providers and may take into account lost income as a consequence of changing farming practices and the number of trees planted. PES programs generally use a fixed payment per hectare for specific activities (Engel, Pagiola & Wunder 2008).

The level of payment is a fundamental factor in the decision of service providers on whether or not to participate in PES programs. However, payment does not necessarily have to be in cash (Smith, Inman & Cherrington 2012). Some farmers and landowners are willing to participate in PES programs even with minimal cash payment if they receive other forms of 'compensation' such as technical assistance, skills training or planting materials (George et al. 2009; Lasco et al. 2008). The mode of payment is subject to negotiations between the water utility and service providers and may be a combination of cash, in-kind and technical assistance. When cash payment is involved, small but regular payments that resemble regular income flows has socio-economic advantages and is more incentive compatible than large one-off payment (Wunder 2007).

Negotiating with a large number of farmers can result in high transaction costs (Ferraro 2008; Wunder 2007). One way of reducing these costs is to negotiate either with the village leader or the traditional leader, or with farmers' organisations if such organisations exist in the area. However, the extent to which leaders and other organisations are legitimate negotiators of agreements can only be determined through wide-ranging community consultation. Public consultations increase transaction costs, but are a necessary condition for increasing water charges (LWUA 2005). A crucial component of public consultations should be the provision of information regarding the importance of the MANP catchment areas as a source of safe drinking water and the link between watershed conservation and continuity of water supply. This is consistent with the results of this research that indicate willingness to pay is significantly positively influenced by household water users' awareness about the MANP as the source of their water supply, as well as the importance they attach to the MANP as a source of safe drinking water.

After determining the necessary activities and other requirements for a PES scheme, the water utility needs to determine the appropriate additional water charge that will explicitly be allocated for watershed protection activities. The additional payment can be a flat rate on top of the monthly water bill regardless of water consumption, or a percentage of the water bill, which is directly linked to water consumption. Charging a flat rate per consumer facilitates the estimation of the total payment that will be collected within a time period, but may disadvantage poor households.

Charging an additional payment as a percentage of the total water bill means that households that consume more water will pay more (Moreno-Sanchez et al. 2012). Thus, this form of payment has the potential to encourage efficient water utilisation among household users. This could then reduce the amount available for watershed maintenance, which is unlikely to be correlated with water use. The amount of additional payment is largely dependent on the requirements of watershed conservation activities, including their duration, and the level of consultation with water users. One potential scheme could be a hybrid scheme with a small fixed payment and a percentage of water used above a threshold.

10.4.2 Payment for environmental services mechanism for climbing

For any PES scheme related to climbing, climbers to Mount Apo would be the users and beneficiaries, municipal tourism offices the intermediaries and a climbing fee the payment vehicle. A portion of the climbing fee is supposed to be remitted to the IPAF through the DENR to finance activities for the protection and management of the

MANP (DENR 2008). Data released by the DENR of the revenue generated by protected areas through 2011 indicated that the MANP was not among the Philippines' top ten revenue generating protected areas (DENR-PAWB 2012). However, available data on climbers to Mount Apo indicate that total nominal income from 2008 to 2011, based on the climbing fee of PhP 500 (AUD 11.76), was at least PhP 5.154 million (approximately AUD 118,000). This amount was 12% more than income of the 10th most lucrative protected area in the Philippines indicated in the DENR-PAWB list.

Based on the researcher's personal observation of some trails, there is an urgent need to rehabilitate and improve sections of the trails to ensure the safety of climbers and to prevent further damage to the surrounding areas, such as erosion. Upland dwellers who reside in communities traversed by climbing trails are the potential providers of environmental services to improve the climbing experience and minimise damage to the forest and watershed areas. Payment to service providers can be based on the length or steepness of trails to be rehabilitated or managed, including placing signage and removing litter left by climbers. One possible incentive to encourage participation is preferential employment as climbing guides or porters during the climbing season, with capacity-building to improve their conversational English-speaking skills and/or knowledge of the biodiversity of the MANP.

The estimated consumer surplus for climbing Mount Apo indicates that there is scope to double the existing fee. However, it is necessary to explicitly indicate how much of the fee increase will go to the rehabilitation and maintenance of the trails, which can provide local jobs. Increasing the climbing fee may decrease the number of climbers in the short-run and an unintended consequence may be an increase in illegal climbers. However, research suggests that willingness to pay for access to national parks adjusts as the entrance fee increases (Chase et al. 1998). The iconic status and irreplaceable nature of Mount Apo as the Philippines' highest mountain ensures that climbers will continue to come. The demand for unique natural attractions that involve long travel distances also tend to be price inelastic (Clawson & Knetsch 1966). This implies that the cost of visiting an area does not have much influence on the decision to visit. Currently, the entrance fee is a small proportion of total cost of climbing Mount Apo.

The transaction costs involved in a PES program for climbing Mount Apo includes the costs of negotiating with potential service providers and monitoring performance outcomes, which is the basis of payment. Costs will also be incurred for information dissemination to inform the public of an increase in the climbing fee, which would have to occur before the implementation of the new fee structure. Information

dissemination can be done in several ways. The most cost-effective means are through websites of local government units that host climbing trials, travel agencies and mountain climbing groups. Another possible means of information dissemination is through local and national newspapers.

10.4.3 Payment for environmental services mechanism for biodiversity conservation

Design for a PES scheme for biodiversity conservation is particularly challenging because the multiple services provided by biodiversity are public goods, making it difficult to identify and delimit the beneficiaries/users (Engel, Pagiola & Wunder 2008). There is a perception that, as biodiversity conservation is less vital than human well-being (Wunder, Sven & Wertz-Kanounnikoff 2009), it should not be a local priority in some developing countries (Labao et al. 2007; Sheil et al. 2006), and therefore funding for biodiversity conservation usually depends on donor support (Hein, Miller & de Groot 2013; Sheil et al. 2006; Subade 2007; Villamor et al. 2007).

Society's willingness to pay for biodiversity conservation remains limited and international donors are reluctant to invest in long term payment schemes (Wunder, Sven & Wertz-Kanounnikoff 2009). Some authors suggest that biodiversity conservation may partly benefit from watershed protection or ecotourism (Ferraro & Kiss 2002; Hein, Miller & de Groot 2013; Rolfe 2010; Wunder & Wertz-Kanounnikoff 2009). Three possible approaches to "package" biodiversity conservation with either ecotourism or watershed protection are (1) bundling, (2) layering and (3) piggybacking (Wunder, Sven & Wertz-Kanounnikoff 2009). Bundling refers to having the same beneficiary knowingly pay for a package of services, such as water users paying for both watershed protection and conservation of certain bird species. Layering happens when different beneficiaries pay for a package of services from the same land area, such as water users paying for watershed services and bird watchers paying for bird conservation. Piggybacking is when beneficiaries pay for an umbrella service with biodiversity as a "free rider", such as water users paying for watershed protection services that also conserve biodiversity.

Payment for biodiversity conservation is practically non-existent in the Philippines (Villamor & Lasco 2009). Results of this research reveals a potential for the establishment of a PES mechanism for biodiversity conservation at the MANP based on the general public's willingness to pay for the protection of plants and animals.

For a PES mechanism to conserve and protect biodiversity at the MANP, the beneficiaries who pay for biodiversity conservation would be the general public, the local government would act as the intermediary (city or municipal government) and upland dwellers/farmers and indigenous peoples would be the service providers. The potential payment vehicle would be the community tax[21], which is currently paid to the local government in an individual's place of residence and is separate from income tax.

Payment schemes for biodiversity conservation are either action-based or outcome/results-based (Derissen & Quaas 2013; Gibbons et al. 2011). Action-based payments depend on a specified action or measure believed to increase biodiversity, such as adopting a particular land use or planting species to support the habitat of threatened animal species. Outcome/results-based payments are directly linked to the desired outcome, such as the number of endangered animal offspring produced, but shifts the risk to service providers and also requires a sophisticated and expensive monitoring system. Some authors suggest that a combination of payment schemes is likely to yield better results due to environmental uncertainty and information asymmetry, wherein not all involved in the programme have access to all relevant information (Derissen & Quaas 2013).

Relative to a PES mechanism for either watershed protection or climbing, designing a PES mechanism for biodiversity conservation in the MANP is more challenging and involves higher transaction costs for a number of reasons. First, there is insufficient baseline data on biodiversity in the MANP. Second, residents of the forest fringes are generally poor and are likely to prioritise their livelihood over conservation. Third, the benefits derived from biodiversity conservation are not as evident as the benefits derived from water provision or landscape beauty, which can possibly influence actual willingness to pay.

There are possible ways to deal with the abovementioned challenges. The issue of insufficient baseline data can be addressed by collaborating with academic institutions in Mindanao to conduct research that focuses on generating baseline information. These academic institutions can tap research funds that are not normally available to government institutions. The issue of poverty may be addressed by

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[21] "Every inhabitant of the Philippines eighteen (18) years of age or over who has been regularly employed on a wage or salary basis for at least thirty (30) consecutive working days during any calendar year, or who is engaged in business or occupation, or who owns real property with an aggregate assessed value of One thousand pesos (P=1,000.00) or more, or who is required by law to file an income tax return shall pay an annual community tax of five Pesos (P=5.00)" (Section II, Local Government Code of 1991).

designing a payment scheme that will provide different types of payment (cash, in-kind, technical assistance or capability-building), such that cash income can be supplemented by social benefits (Greiner & Stanley 2013; Ingram et al. 2014).

Lack of information about the benefits of biodiversity may be addressed by extensive information and education campaigns to increase awareness about the plants and animals that thrive at the MANP, as well as the benefits of conserving them. This research finds that awareness about the MANP as being home to plants and animals has a significant influence on willingness to pay for conservation. An effective information and education campaign would require cooperation among local government units, academic institutions, non-government organisations, DENR and other government agencies, such as the Department of Agriculture. It is imperative that any such information and education campaigns be conducted in the local dialect so that it can be understood by the majority of people.

As with increasing water rates, the collection of additional taxes requires a public hearing (Article 6, Section II, Local Government Code of 1991). This could be an added but necessary transaction cost. The final payment would be determined after public consultation and may be significantly less than the consumer surplus of PhP 740 (AUD 17.41). However, one major concern with taxes is that the funds collected may go into consolidated revenue. This could be addressed by local government units through the creation of a trust account for the amount collected for biodiversity conservation. A PES mechanism alone cannot be expected to provide sufficient funding to address biodiversity loss, but it could make an important contribution towards biodiversity conservation (Hein, Miller & de Groot 2013).

10.4.4 Principles and processes

This research forms part of Phase I (exploration phase) of potential PES schemes in the Philippines, particularly for the MANP. Moving forward with any PES scheme necessitates several processes. The exploration phase is followed by the development phase, which focuses on negotiating and deciding on components and the governance structure. The specific concerns of a potential PES scheme include: (1) identifying the final goal, (2) measurement of environmental service provision, (3) payment structure (payment by ecosystem service users/beneficiaries and payment to environmental service providers), (4) duration of contract, and (5) property rights. The details for each ecosystem service under consideration are likely to vary, except for property rights and contraction duration.

The MANP is a government-owned protected area with a large portion of it also being the ancestral domain of indigenous peoples. This means that indigenous peoples have a communal right to manage the land, while non-indigenous peoples can apply for tenured migrant status.[22] Contract duration depends on negotiations among relevant PES actors. In some developing countries, initial contract duration of PES schemes ranged from five to 10 years, with the possibility of renewal subject to evaluation in the initial contract (Cortina-Villar et al. 2012; Southgate & Wunder 2009).

For watershed protection, the final goal could be continued water supply, and environmental provisions could be measured in terms of the watershed areas that are reforested or protected. Water users could make a monthly payment through their water bill, while environmental service providers could be paid annually in cash and also provided with periodic technical assistance and in-kind payment, such as seedlings.

For climbing, the final goal of PES could be safe climbing to the peak of Mount Apo, with as little disturbance as possible to the biodiversity of the area. A possible measure of environmental service provision is the length of trail rehabilitated or maintained. Payment by climbers could be made on a per climb per person basis, while payment to environmental service providers could be made in several forms. Immediate payment could be made after the contracted service is provided, such as putting up railings or signs on portions of the trail. Annual payment could be made for trail maintenance which could include ensuring that trees in the immediate surroundings of the trails are not cut. In-kind payment could also be made to service providers in the form of capability building for improving English skills and enhancing knowledge about biodiversity in the MANP. These in-kind payments would be particularly useful for those who work, or are interested in working as climbing porters or guides.

For biodiversity conservation, the final goal could be the protection and conservation of specific plant or animal species. The provision of environmental services could be measured in two ways: (1) protection or reforestation of an area that is known to be the habitat of a target plant or animal; and (2) an observable increase in plant density or actual sightings of the animal. Cash payments can be provided annually for reforestation activities, with additional payment conditional on improvement of plant

[22] Under the NIPAS Act, tenured migrants are granted right to secure sustainable livelihood from the area, but cannot sell the land.

density or sightings of animals. This form of payment is proven to be effective for biodiversity conservation in other developing countries (Ingram et al. 2014).

Pilot testing comes after the development of the PES design, in which negotiations between parties are completed and a contract has been signed. The pilot testing phase determines whether users/beneficiaries actually pay, the service providers actually provide the contracted services, and whether the intermediaries actually facilitate the transactions. The pilot testing phase also provides information on whether potential contract infringements need addressing. The duration and spatial targeting for pilot testing can vary according to the ecosystem service. For the MANP the pilot testing phase could last two years for watershed protection and biodiversity conservation, while one year (two climbing seasons per year) may be sufficient for climbing.

In terms of spatial targeting, watershed protection could be pilot tested for a small portion of the watershed area with available relevant information, such as existing forest cover, water discharge, presence of important plants and animals and livelihood activities of communities within or on the periphery of the area. For biodiversity conservation, pilot testing could be done in the known natural habitat of important animal species, such as the critically endangered Philippine eagle. For climbing, pilot testing could simultaneously be done in two climbing trails, particularly for portions of the trails that require immediate rehabilitation.

After the completion of pilot testing, a PES scheme should be ready for full scale implementation. The implementation phase would require a monitoring system to determine any contract infringement, the level of achievement of PES goals and possible reasons for contract renegotiation.

11 Conclusions and recommendations

11.1 Conclusions

Protected areas are a cornerstone internationally, and in the Philippines, for biodiversity conservation and they also provide a raft of other ecosystem services. People benefit through water provision and recreation. Like elsewhere, protected areas in the Philippines suffer from underfunding as funding mainly comes from government consolidated revenue. Insufficient funding means that the authorities tasked with their management are unable to do all they can to maintain the desired level of ecosystem services. This research provides empirical evidence for one protected area in the Philippines in which there is scope to widen the funding base for protected area management through targeted PES schemes. This involves a range of local communities and stakeholders providing environmental services and safeguarding the various values of protected areas into the future.

This research has made a contribution to the knowledge and understanding of the values to users and beneficiaries of ecosystem goods and services in protected areas in the Philippines, with a specific focus on the MANP. The research estimated the consumer surplus for water provision, biodiversity conservation and recreational use, and the lower-bound of the total economic value of the MANP. The estimated consumer surplus for water provision presents the potential to generate about PhP 8.5 million per year for watershed protection. The estimated consumer surplus for climbing indicates the potential to double climbing fees without a long-term negative impact on the income derived from climbing.

The total economic value of the MANP was estimated at PhP 6482 million (approximately AUD 153 thousand), or about PhP 118 thousand (AUD 2776) per hectare (at 2010 values). The use value of water provision for domestic use accounts for 38% of TEV, while the non-use value of biodiversity accounts for 47% of TEV. The remaining 15% of TEV is accounted for by option and non-use values of watershed protection, use value for climbing and the option value of climbing. The estimated total economic value of the MANP contributes to around 2% of the combined gross regional domestic product of Regions 11 and 12 in Mindanao. However, the total economic value is likely to be higher if the estimation includes all users and beneficiaries of water from the MANP watershed areas, as well as users and beneficiaries of recreational opportunities other than climbing.

This research finds that awareness of the hydrologic services of the MANP and the presence of important plants and animals significantly increases the willingness to pay for watershed protection and biodiversity conservation, respectively. The research also finds that climbers who reside further from the MANP were willing to pay significantly higher amounts for climbing.

The empirical research findings clearly establish the economic potential for PES schemes in watershed protection, biodiversity conservation, and mountain climbing in the MANP. PES schemes could address funding problems of protected area management and generate supplemental funds for management and protection of the MANP. PES designs for either watershed protection or climbing present the greatest potential, while a PES scheme for biodiversity conservation is likely to be the most challenging to design.

This research finds that properly designed PES schemes have the potential to facilitate the achievement of the following key management programs for the MANP that were identified in the general management plan: (1) biodiversity research, protection and rehabilitation; (2) indigenous peoples' affairs and cultural programs; (3) community-based resource management programs; (4) participatory and community-based ecotourism programs; and (5) institutional strengthening, partnership and co-management programs.

11.2 Recommendations

Based on results of this research, several recommendations are presented related to the design of PES programs.

1) That the PAMB:
    a. consider and progress the implementation of PES schemes within the MANP;
    b. commission (and fund) biodiversity research in the MANP to generate baseline information for biodiversity in the different management zones of the MANP;
    c. commission (and fund) socio-economic research in the MANP to generate baseline information on the socio-economic profile of communities living within the multiple-zone use and buffer zones of the MANP;
    d. Initiate an information and education campaign to increase awareness among the general public of the hydrologic services and biodiversity provided by the MANP;

e. coordinate with the Department of Agriculture and other relevant agencies to provide farmers operating within the MANP regular training or technical assistance on sustainable agricultural practices to improve production while reducing the use of inorganic chemicals that have a negative impact on watershed areas;
f. initiate consultations with local communities in and around areas in the MANP known as natural habitats of important plants and animals to reduce the poaching of rare animals and plants, and solicit feedback on their willingness to participate in potential PES for biodiversity conservation; and
g. make representations to relevant government agencies to explore possible mechanisms for allocating a portion of community tax revenues towards biodiversity conservation.

2) That water utilities initiate the development phase of PES design for watershed protection.
3) That local tourism offices initiate the development phase of PES design for mountain climbing and other recreational opportunities in the MANP.

11.3 Further research

Based on the findings of this research, there is an identified need for further research in order to implement PES schemes for the Philippines in general, and the MANP in particular.

This research finds that a lack of knowledge on the link between watershed protection and water supply was cited as one reason why water users might not be willing to pay for watershed protection. This implies the need for a review of global research on the link between watershed protection and water supply be made in a form that is locally accessible.

Estimate of consumer surplus for climbing was based solely on contingent valuation results. Future research can include estimating both contingent valuation and travel cost models and derive consumer surplus from both models. Future contingent valuation studies related to climbing and other tourism activities may also have to test for anchoring of stated WTP on costs incurred by climbers or tourists.

For biodiversity conservation, the major challenge is the lack of baseline information on the biodiversity of the MANP. In the short-term, conducting a rapid biodiversity assessment at various elevations is necessary to establish baseline data. It will also be important to determine the density of those resources. This information is

necessary in spatial targeting of the PES scheme. Existing literature indicates that PES schemes that incorporate spatial targeting are more likely to be effective than PES schemes without spatial targeting.

Across ecosystem services, designing PES schemes requires a knowledge and understanding of the socio-economic profile of communities residing within the MANP and surrounding areas. Those communities are potential environmental service providers. Currently, there is no updated comprehensive data on the socio-economic profile of those communities and the current level of usage—legitimate and illegal—of the MANP. In the short-run, a rapid assessment of the socio-economic profile of communities is necessary. The profiling research should also be able to establish a monitoring system that will facilitate the updating of information. Thus, the research should involve community participation to facilitate capability building so that future updating of information can be undertaken by community members.

An important issue to address in any PES scheme is who will provide the environmental service. The sustainable provision of ecosystem services can entail hard trade-offs, particularly for those who are in a position to provide necessary environmental services. Potential service providers may be required to alter existing agricultural practices, or engage in other activities that negatively impact their current livelihood or well-being. Existing literature provides some insight into the factors that may influence the willingness of potential environmental service providers to participate in PES schemes. Further research that provides knowledge and an understanding of the factors that are likely to influence willingness to participate as environmental service providers is likely to inform design of PES schemes for the MANP.

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Appendices

Appendix 1: Original ethics clearance

Charles Darwin UNIVERSITY

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ABN 54 093 513 649
CRICOS 00300K

Research Office, Casuarina Campus Ph: 08 8946 6498 Fax: 08 8946 7199 Email: cdu-ethics@cdu.edu.au

8 April 2010

Ms Aurelia Gomez
Institute of Advanced Studies
School for Environmental Research
Charles Darwin University
Darwin NT 0909

Dear Ms Gomez

RE: APPLICATION FOR ETHICAL CLEARANCE, REFERENCE NO. H10001.

The Charles Darwin University Human Research Ethics Committee has approved your application for ethics clearance for your project titled *Potential of payments for environmental services (PES) for natural resources conservation and management in Mindanao, Philippines.*

The HREC recommends providing a copy of the letter from PAMB granting their consent to conduct the project. Please find attached a notice of clearance.

The expiry date of ethics approval for your project is **25 March 2011**. It is the responsibility of the researcher to ensure that ethics approval is renewed prior to the expiry date. If renewal is necessary, you will need to submit a progress report including a statement of compliance with ethical requirements, and detailing any proposed or actual changes to the project, which may affect its ethical acceptability. Renewal/Final Report forms are available from the Web at: http://www.cdu.edu.au/research/office/renew_final_04.rtf or from the Research Office.

If any significant alterations to your project are contemplated, or if any matters arise which may conceivably affect the continued ethical acceptability of the project, you are required to immediately notify the Human Research Ethics Committee by letter.

Our best wishes for the success of your project.

Yours sincerely

Plaxy Purich
Executive Officer

for Professor Robert Wasson
Chair, Human Research Ethics Committee

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HUMAN RESEARCH ETHICS COMMITTEE CLEARANCE

NEW PROPOSAL

HREC REFERENCE:	**H10001**
PROJECT TITLE:	**Potential of payments for environmental services (PES) for natural resources conservation and management in Mindanao, Philippines**
CHIEF INVESTIGATOR(S):	**Ms Aurelia Gomez**

The Charles Darwin University Human Research Ethics Committee has considered your project.

The Committee is satisfied that the research proposed in this project conforms with the general principles set out in the current National Health and Medical Research Council regulations, and with the policy of the Charles Darwin University.

It should be noted that data must be stored securely on campus. Storage in a central facility (with limited access if necessary) is available. Researchers should address any queries concerning data storage to their relevant faculty.

Expiry date: **25 March 2011**

Please Note: A Final Report is due on completion of this project, or if the project extends beyond the expiry date a progress report is due before the date of expiry.

APPROVED

for R. Wasson

Chair,
CDU Human Research Ethics Committee

Dated 08/04/10

c.c. Supervisor, Prof Stephen Garnett, Prof Romy Greiner

Research Office, Casuarina Campus Ph: 08 8946 6498 Fax: 08 8946 7199 Email: cdu-ethics@cdu.edu.au

Casuarina Campus Ellengowan Drive, Darwin **Palmerston Campus** University Avenue, Palmerston
Postal Address: Darwin, Northern Territory 0909 Australia
Telephone: +61 8 8946 6666 **Facsimile:** +61 8 8927 0612

Appendix 2: Renewal of ethics clearance, 2011-2012

CHARLES DARWIN UNIVERSITY

CHARLES DARWIN UNIVERSITY
Ellengowan Drive, Darwin, Northern Territory 0909
ABN 54093 513 649 | CRICOS Provider No. 00300K | RTO Provider No. 0373
cdu.edu.au

Ms Aurelia Gomez
Institute of Advanced Studies
Charles Darwin University
Darwin NT 0909

16 May, 2011

Dear Ms Gomez

APPLICATION FOR RENEWAL OF ETHICS CLEARANCE, REF. NO. H10001

The Charles Darwin University Human Research Ethics Committee has approved your application for renewal of ethics clearance for your project titled *Potential of payments for environmental services (PES) for natural resources conservation and management in Mindanao, Philippines.* Please find attached a notice of clearance.

The expiry date of ethics approval for your project is **20 April 2012**. It is the responsibility of the researcher to ensure that ethics approval is renewed prior to the expiry date. If further renewal is necessary, you will need to submit a progress report including a statement of compliance with ethical requirements, and detailing any proposed or actual changes to the project, which may affect its ethical acceptability. A Final Report will be due upon completion of the project. Renewal/Final Report forms may be downloaded from the Web at: http://www.cdu.edu.au/research/office/renew_final_04.rtf or obtained from the Office of Research & Innovation.

If any significant alterations to your project are contemplated, or if any matters arise which may conceivably affect the continued ethical acceptability of the project, you are required to immediately notify the Human Research Ethics Committee.

Yours sincerely

Professor Sharon Bell
Chair, CDU Human Research Ethics Committee

DEPARTMENT NAME
T. +61 8 8946 6923| F. +61 8 8946 7066 | E. cdu-ethics@cdu.edu.au

CHANGE YOUR WORLD

CHARLES DARWIN UNIVERSITY

HUMAN RESEARCH ETHICS COMMITTEE REPORT

RENEWAL OF CLEARANCE

PROJECT REFERENCE:	**H10001**
PROJECT TITLE:	**Potential of payments for environmental services (PES) for natural resources conservation and management in Mindanao, Philippines**
CHIEF INVESTIGATOR(S):	**Aurelia Gomez**

The Charles Darwin University Human Research Ethics Committee has considered the above mentioned renewal application.

The Committee is satisfied that the research proposed in this project conform with the general principles set out in the current National Health and Medical Research Council regulations, and with the policy of the Charles Darwin University.

The Charles Darwin University Human Research Ethics Committee has therefore approved renewal of clearance for your project for a further twelve months.

It should be noted that data may be stored (with limited access if necessary) at a central facility at the University. Researchers should address any queries concerning data storage to their relevant faculty.

EXPIRY DATE: **20 April 2012**

Chair, CDU Human Research Ethics Committee — ***Dated:*** 17. 5. 2011

Appendix 3: Renewal of ethics clearance, 2012-2013

CHARLES DARWIN UNIVERSITY
Ellengowan Drive, Darwin, Northern Territory 0909
ABN 54093 513 649 | CRICOS Provider No. 00300K | RTO Provider No. 0373
cdu.edu.au

4 July 2012

Ms Aurelia Gomez
RIEL
Charles Darwin University
Darwin NT 0909

Dear Ms Gomez

RE : H12087 - *Potential of payment for environmental services (PES) as an approach to natural resources conservation and management in Mindanao, Philippines*
APPLICATION FOR RENEWAL OF ETHICS CLEARANCE

The Charles Darwin University Human Research Ethics Committee considered and approved your application for renewal of ethics clearance at meeting 3/12, held on 29/11/11. Please find attached a notice of clearance.

The expiry date of ethics approval for your project is **21 June 2013**. It is the responsibility of the researcher to ensure that ethics approval is renewed prior to the expiry date. If further renewal is necessary, you will need to submit a progress report including a statement of compliance with ethical requirements, and detailing any proposed or actual changes to the project, which may affect its ethical acceptability. A Final Report will be due upon completion of the project. Renewal/Final Report forms may be downloaded from the Web at: http://www.cdu.edu.au/research/office/renew_final_04.rtf or obtained from the Office of Research & Innovation.

If any significant alterations to your project are contemplated, or if any matters arise which may conceivably affect the continued ethical acceptability of the project, you are required to immediately notify the Human Research Ethics Committee.

Yours sincerely

Professor Sharon Bell
Chair, CDU Human Research Ethics Committee

DEPARTMENT NAME
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CHANGE YOUR WORLD

CHARLES DARWIN UNIVERSITY

HUMAN RESEARCH ETHICS COMMITTEE REPORT

RENEWAL OF CLEARANCE

PROJECT REFERENCE: H12087

PROJECT TITLE: **Potential of payment for environmental services (PES) as an approach to natural resources conservation and management in Mindanao, Philippines**

CHIEF INVESTIGATOR(S): **Aurelia Gomez**

The Charles Darwin University Human Research Ethics Committee has considered the above mentioned renewal application.

The Committee is satisfied that the research proposed in this project conforms with the general principles set out in the current National Health and Medical Research Council regulations, and with the policy of the Charles Darwin University.

The Charles Darwin University Human Research Ethics Committee has therefore approved renewal of clearance for your project for a further twelve months.

It should be noted that data may be stored (with limited access if necessary) at a central facility at the University. Researchers should address any queries concerning data storage to their relevant faculty.

EXPIRY DATE: **21 June 2013**

Chair, CDU Human Research Ethics Committee

Dated: 6. 7. 2012

cc: Prof Romy Greiner - for information.

Appendix 4: Renewal of ethics clearance, 2013-2014

CHARLES DARWIN UNIVERSITY

CHARLES DARWIN UNIVERSITY
Ellengowan Drive, Darwin, Northern Territory 0909
ABN 54093 513 649 | CRICOS Provider No. 00300K | RTO Provider No. 0373
cdu.edu.au

10 July 2013

Ms Aurelia Gomez
RIEL

Dear Ms Aurelia Gomez

RE: **H13055 Gomez,** *Potential of payment for environmental services (PES) as an approach to natural resources conservation and management in Mindanao, Philippines.*

APPLICATION FOR RENEWAL OF ETHICS CLEARANCE

The Charles Darwin University Human Research Ethics Committee considered and approved your application for renewal of ethics clearance at meeting 4/13, held on 20th June 2013.

Please find attached a notice of clearance.

The expiry date of ethics approval for your project is **20th June 2014**. It is the responsibility of the researcher to ensure that ethics approval is renewed prior to the expiry date. If further renewal is necessary, you will need to submit a progress report including a statement of compliance with ethical requirements, and detailing any proposed or actual changes to the project, which may affect its ethical acceptability. A Final Report will be due upon completion of the project. Renewal/Final Report forms may be downloaded from the Web at: http://www.cdu.edu.au/research/office/renew_final_04.rtf or obtained from the Office of Research & Innovation.

If any significant alterations to your project are contemplated, or if any matters arise which may conceivably affect the continued ethical acceptability of the project, you are required to immediately notify the Human Research Ethics Committee.

Yours sincerely

Professor Sharon Bell
Chair, CDU Human Research Ethics Committee

DEPARTMENT NAME
T. +61 8 8946 6923| F. +61 8 8946 7066 | E. cdu-ethics@cdu.edu.au

CHANGE YOUR WORLD

CHARLES DARWIN UNIVERSITY

HUMAN RESEARCH ETHICS COMMITTEE REPORT

RENEWAL OF CLEARANCE

PROJECT REFERENCE: H13055

PROJECT TITLE: *Potential of payment for environmental services (PES) as an approach to natural resources conservation and management in Mindanao, Philippines*

CHIEF INVESTIGATOR(S): **Ms Aurelia Gomez**

The Charles Darwin University Human Research Ethics Committee has considered the above mentioned renewal application.

The Committee is satisfied that the research proposed in this project conforms with the general principles set out in the current National Health and Medical Research Council regulations, and with the policy of the Charles Darwin University.

The Charles Darwin University Human Research Ethics Committee has therefore approved renewal of clearance for your project for a further twelve months.

It should be noted that data may be stored (with limited access if necessary) at a central facility at the University. Researchers should address any queries concerning data storage to their relevant faculty.

EXPIRY DATE: **20th June 2014**

Chair, CDU Human Research Ethics Committee

Dated: 19.7.2013

cc: Romy.Greiner@cdu.edu.au

Appendix 5: Consent form

Charles Darwin UNIVERSITY

Darwin, NT 0909 Australia
www.cdu.edu.au
CRICOS 00300K

Adult Consent Form for

PROJECT TITLE: Potential of payments for environmental services (PES) for natural resources conservation and management in Mindanao, Philippines

I, _____ of_____

_____

hereby consent to participate in a study to be undertaken by Aurelia Luzviminda Gomez of Charles Darwin University, Australia and I understand that the purpose of the research is to determine the potential of using payment for environmental services (PES) to help manage and conserve the natural resources in Mindanao, particularly Mt. Apo Natural Park. This will involve determining the users and beneficiaries of the different resources provided by Mt. Apo, the existing arrangements that affect the use and conservation of the resources, and the values that different people place on these resources.

I acknowledge that:

- the aims, methods, and anticipated benefits, and possible risks of the study, have been explained to me by Aurelia Luzviminda Gomez
- I voluntarily and freely give my consent to my participation in such study.
- I understand that aggregated results will be used for research purposes and may be reported in scientific journals and academic journals.
- individual results **will not** be released to any person except at my request and on my authorisation.
- I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease, and any information obtained will be returned to me or destroyed at my request.

Signature: _____ Date: _____

Appendix 6: Plain language statement

Charles Darwin
UNIVERSITY

Darwin, NT 0909 Australia
www.cdu.edu.au
CRICOS 00300K

PLAIN LANGUAGE STATEMENT

PROJECT: Potential of payments for environmental services (PES) for natural resources conservation and management in Mindanao, Philippines

CHIEF INVESTIGATOR: Aurelia Luzviminda Gomez

PURPOSE OF THE STUDY:
This research project is being conducted by Ms Aurelia Luzviminda Gomez as part of her PhD studies at Charles Darwin University (CDU) in Australia. Ms Gomez is supported by her PhD supervisors, Prof. Stephen Garnett and Prof. Romy Greiner.

This study is conducted to determine the potential of using payment for environmental services (PES) to help manage and conserve the natural resources in Mindanao, particularly Mt. Apo Natural Park. This will involve determining the users and beneficiaries of the different resources provided by Mt. Apo, the existing arrangements that affect the use and conservation of the resources, and the values that different people place on these resources.

BENEFITS OF THE STUDY:
This study will assist policy makers in their efforts to develop policies that will help to better manage and conserve the natural resources in the Philippines.

WHAT WOULD BE EXPECTED OF YOU?
You will be expected to participate in an interview about your use of the natural resources provided by Mt. Apo Natural Park. The interview will take between five and 30 minutes. At a later stage of the research, you may be invited to participate in a focus group discussion or workshop to talk in more detail about better management and conservation of these resources.

DISCOMFORTS/RISKS:
There is no specific risk associated with this study.

CONFIDENTIALITY:
All information that you provide will be treated with utmost confidentiality. You will not be identified in any publication or report that will come out of this research without your authorisation.

YOUR PARTICIPATION:
Participation is completely voluntary. I would be grateful if you participate in this study but you are free to refuse to participate. If you do decide to participate, you may withdraw from the research at any time. If you participate in focus group discussions, light refreshment will be provided.

RESULTS OF THE STUDY
The results of the study will be presented in various forms. A summary of findings will be provided to the Mt. Apo Protected Area Management Board (PAMB). You will be free to look at these results.

PERSONS TO CONTACT
If you have any questions about the project, please contact the researcher, Aurelia Luzviminda Gomez at telephone number 63 9177049512. You may also use this number at any time during the project if you need further information.

If there is an emergency or if you have any concerns before commencing, during, or after the completion of the project, you are invited to contact the Executive Officer of the Charles Darwin University Human Research Ethics Committee on 61 8 8946 6498 or by email: cduethics@cdu.edu.au. The Executive Officer can pass on any concerns to appropriate officers within the University.

This information sheet is yours to keep.

Appendix 7: Contingent valuation scenario

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www.cdu.edu.au
CRICOS 00300K

CONTINGENT VALUATION SCENARIO

for

PROJECT: Potential of payments for environmental services (PES) for natural resources conservation and management in Mindanao, Philippines

CHIEF INVESTIGATOR: Aurelia Luzviminda Gomez

The Mount Apo Natural Park (MANP) is a protected area that is partly lies in portions of Davao del Sur (Davao City, Sta. Cruz, Digos City, Bansalan) and North Cotabato (Makilala, Kidapawan City, Magpet).

The defining feature of the MANP is Mount Apo, the Philippines' highest mountain. Mount Apo is a major attraction for mountain climbers, both local and foreign, and adventurous nature lovers. The MANP is a water catchment area that provides water for domestic, agricultural and commercial uses to millions of people in Mindanao. Within the MANP are forest areas that host important plants and animals. Probably, the most important animal in the MANP is the Philippine Eagle, the Philippines' national bird which is critically endangered.

Problems in the MANP:
Climbing to Mount Apo can damage climbing trails that are properly maintained, damage watershed areas, destroy plants and disturb animal habitat. The watershed areas are also threatened by logging activities and encroachment of agricultural activities.

Purpose of the study:
To determine if beneficiaries of the MANP are willing to pay to conserve and manage the MANP. This is because the government cannot provide sufficient funding for the protection of the MANP.

How will payment be used:
Payment by climbers can be used to maintain climbing trails to ensure safety of climbers, while also ensuring that watershed areas, plants and animal habitat are not destroyed. Payment by household water users may be used to finance activities that will protect the watersheds to ensure continued supply of clean and safe water. Payment by the general public may be utilized to finance activities that will protect the forest areas to ensure continued supply of water and also protect the important plants and animals within the MANP. The actual activities will be determined at a later stage.

Some of the potential risks if beneficiaries will not pay are:
1) climbing to Mount Apo will be very risky and may be stopped;
2) there will be water shortage, as is being experienced in other areas in the Philippines; and
3) The Philippine Eagle, together with other important plants and animals, will disappear completely.

Appendix 8: Survey questionnaire for general public respondents

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CRICOS 00300K

Survey Form for the General Public **G -1-** ***Date***

Please mark your answers with a tick (✓) in the appropriate box or write your answer in the box.

A. Socio-economic information

1. Where is your place of residence?

- ☐ 1) Magpet, North Cotabato
- ☐ 2) Makilala, North Cotabato
- ☐ 3) Bansalan, Davao del Sur
- ☐ 4) Sta. Cruz, Davao del Sur
- ☐ 5) Davao City
- ☐ 6) Digos City
- ☐ 7) Kidapawan City
- ☐ 8) Others (pls specify municipality and province or city)_____

2. What is your gender?

- ☐ 1) Male
- ☐ 2) Female

3. What is your age group?

- ☐ 1) 15yrs old or below
- ☐ 2) 16-25 yrs old
- ☐ 3) 26-35 yrs old
- ☐ 4) 36-45 yrs old
- ☐ 5) 46-55 yrs old
- ☐ 6) 56-65 yrs old
- ☐ 7) 66 yrs and older

4. What is your highest level of education?

- ☐ 1) No formal schooling
- ☐ 2) Some elementary
- ☐ 3) Elementary graduate
- ☐ 4) Some high school
- ☐ 5) High school graduate
- ☐ 6) Some college
- ☐ 7) College graduate
- ☐ 8) Post graduate
- ☐ 9) Vocational

5. What is your occupation?

- ☐ 1) Official of government and special-interest group, corporate executive, manager, managing proprietor or supervisor
- ☐ 2) Professional
- ☐ 3) Technician and associate professional
- ☐ 4) Clerk
- ☐ 5) Service worker and shop and market sales worker
- ☐ 6) Farmer, forestry worker or fisherfolk
- ☐ 7) Trader or related worker
- ☐ 8) Plant and machine generator or assembler
- ☐ 9) Laborer
- ☐ 10) Student
- ☐ 11) Others (pls specify) _____

Appendix 8: Survey questionnaire for general public respondents (page 2 of 3)[23]

Survey Form for General Public **G -1-** ***Date***

6. How much is your personal income before taxes?

Monthly income	Annual income
☐ 1) Below PhP3,333	1) Below PhP 40,000
☐ 2) PhP 3,333 – PhP 4,999	2) PhP 40,000 – PhP 59,999
☐ 3) PhP 5,000 – PhP 6,666	3) PhP 60,000 – PhP 79,999
☐ 4) PhP 6,667 – PhP 8,332	4) PhP 80,000 – PhP 99,999
☐ 5) PhP 8,333 – PhP 10,832	5) PhP 100,000 – PhP 129,999
☐ 6) PhP 10,833 – PhP 13,332	6) PhP 130,000 – PhP 159,999
☐ 7) PhP 13,333 – PhP 17,832	7) PhP 160,000 – PhP 189,999
☐ 8) PhP 15,833 – PhP 18,832	8) PhP 190,000 – PhP 219,999
☐ 9) PhP 18,333 – PhP 20,832	9) PhP 220,000 – PhP 249,999
☐ 10) PhP 20,833 – PhP 23,332	10) PhP 250,000 – PhP 279,999
☐ 11) PhP 23,333 – PhP 25,832	11) PhP 280,000 – PhP 319,999
☐ 12) PhP 25, 833 and above	12) PhP 320,000 and above

B. Information related to Mt. Apo

7. How many times have you visited/climbed Mt. Apo? ☐ time/s

8. Do you think you might visit/climb Mt. Apo at some time in the future?

☐ 1) Yes ☐ 2) No ☐ 3) Not sure

9. Are you willing to pay PhP 1000 climb fee per person for each visit/climb to Mt. Apo?

☐ 1) Yes ☐ 2) No

10. What is the maximum amount you are willing to pay for climb fee per person for each visit?

☐ Pesos/visit

11. Are you aware that Mt. Apo is a water catchment area and the source of water for many areas in Mindanao? ☐ 1) Yes ☐ 2) No

12. Are you willing to make a one-off payment of PhP 100 to protect water sources at Mt. Apo?

☐ 1) Yes ☐ 2) No

13. What is the maximum amount of one-off payment are you willing to make to protect water sources at Mt. Apo? ☐ Pesos

[23] The bid amounts indicated in Q9 and Q12 are the minimum bid of 10 bids for climb fee and watershed protection, respectively. The maximum bid for climb fee is PhP 5500, with increments of PhP 500. The maximum bid amount for watershed protection is PhP 1000, with increments of PhP 100

Appendix 8: Survey questionnaire for general public respondents (page 3 of 3)[24]

Survey Form for General Public **G -1-** ***Date***

14. Are you aware that Mt. Apo is home to some rare plants and animals? ☐ 1) Yes ☐ 2) No

15. Are you willing to pay PhP 500/year for the conservation of rare plants and animals at Mt. Apo?
☐ 1) Yes ☐ 2) No

16. What is the maximum amount you are willing to pay per year for the conservation of rare plants and animals at Mt. Apo? ☐ Pesos

17. If you indicated P0 (zero) in Q13 and Q16, please indicate your reason/s.

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative strength of influence of each item on your decision.

	Strongly disagree 1.....	2.....	3.....	4.....	Strongly agree 5
1) We are already paying too much for our water bill					☐
2) I do not believe that improved watershed management will ensure reliable water supply					☐
3) I think it is the government's responsibility to finance watershed protection					☐
4) I think it is the government's responsibility to finance the conservation of rare plants and animals					☐
5) I do not trust the organization that will manage the funds					☐
6) Only the rich people should pay					☐
7) Others (pls specify) _____					☐

18. How important to you are the following?

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative importance to you of each item.

	Not at all important 1.....	2.....	3.....	4.....	Very important 5
1) People are able to climb Mt. Apo					☐
2) People can safely drink water that comes from Mt. Apo catchment areas					☐
3) People can see the Philippine eagle or other rare plants and animals on Mt. Apo					☐
4) The Philippine eagle and other rare plants and animals live in Mt. Apo					☐
5) People are living on the footslopes of Mt. Apo					☐
6) Food crops are being grown on the footslopes of Mt. Apo					☐

Thank you very much for your time and cooperation ☺

[24] The bid amount indicated in Q15 is the minimum bid biodiversity conservation. The maximum bid PhP 5000, with increments of PhP 500

Appendix 9: Survey questionnaire for household water user respondents

Charles Darwin UNIVERSITY

Darwin, NT 0909 Australia
www.cdu.edu.au
CRICOS 00300K

Survey Form for Water users **W -1-** ***Date***

Please mark your answers with a tick (✓) in the appropriate box or write your answer in the box.

A. Socio-economic information

1. Where is your place of residence?

- ☐ 1) Magpet, North Cotabato
- ☐ 2) Makilala, North Cotabato
- ☐ 3) Bansalan, Davao del Sur
- ☐ 4) Sta. Cruz, Davao del Sur
- ☐ 5) Davao City
- ☐ 6) Digos City
- ☐ 7) Kidapawan City
- ☐ 8) Others (pls specify municipality and province or city)_____

2. What is your gender?

- ☐ 1) Male
- ☐ 2) Female

3. What is your age group?

- ☐ 1) 15yrs old or below
- ☐ 2) 16-25 yrs old
- ☐ 3) 26-35 yrs old
- ☐ 4) 36-45 yrs old
- ☐ 5) 46-55 yrs old
- ☐ 6) 56-65 yrs old
- ☐ 7) 66 yrs and older

4. What is your highest level of education?

- ☐ 1) No formal schooling
- ☐ 2) Some elementary
- ☐ 3) Elementary graduate
- ☐ 4) Some high school
- ☐ 5) High school graduate
- ☐ 6) Some college
- ☐ 7) College graduate
- ☐ 8) Post graduate
- ☐ 9) Vocational

5. What is your occupation?

- ☐ 1) Official of government and special-interest group, corporate executive, manager, managing proprietor or supervisor
- ☐ 2) Professional
- ☐ 3) Technician and associate professional
- ☐ 4) Clerk
- ☐ 5) Service worker and shop and market sales worker
- ☐ 6) Farmer, forestry worker or fisherfolk
- ☐ 7) Trader or related worker
- ☐ 8) Plant and machine generator or assembler
- ☐ 9) Laborer
- ☐ 10) Student
- ☐ 11) Others (pls specify) _____

Appendix 9: Survey questionnaire for household water user respondents (page 2 of 5)

Survey Form for Water users **W -1-** ***Date***

6. How much is your household's total income before taxes?

	Monthly income	Annual income
☐	1) Below PhP3,333	1) Below PhP 40,000
☐	2) PhP 3,333 – PhP 4,999	2) PhP 40,000 – PhP 59,999
☐	3) PhP 5,000 – PhP 6,666	3) PhP 60,000 – PhP 79,999
☐	4) PhP 6,667 – PhP 8,332	4) PhP 80,000 – PhP 99,999
☐	5) PhP 8,333 – PhP 10,832	5) PhP 100,000 – PhP 129,999
☐	6) PhP 10,833 – PhP 13,332	6) PhP 130,000 – PhP 159,999
☐	7) PhP 13,333 – PhP 17,832	7) PhP 160,000 – PhP 189,999
☐	8) PhP 15,833 – PhP 18,832	8) PhP 190,000 – PhP 219,999
☐	9) PhP 18,333 – PhP 20,832	9) PhP 220,000 – PhP 249,999
☐	10) PhP 20,833 – PhP 23,332	10) PhP 250,000 – PhP 279,999
☐	11) PhP 23,333 – PhP 25,832	11) PhP 280,000 – PhP 319,999
☐	12) PhP 25, 833 and above	12) PhP 320,000 and above

7. How many persons live in this household? ☐ persons

8. How many children (below 15 years old) live in this household? ☐ children

B. Information related to water supply from your water district

9. Do you have problems with the continuity of your water supply? ☐ 1) Yes ☐ 2) No

10. How much water, on average (in cubic meters), does your household consume in a month?
☐ m^3

11. How much was your water bill last month? ☐ Pesos

12. During the past 12 months, how much was your lowest monthly water bill? ☐ Pesos

13. During the past 12 months, how much was your highest monthly water bill? ☐ Pesos

14. Approximately what percentage of your total monthly household expenditure is your water bill? ☐ %

Appendix 9: Survey questionnaire for household water user respondents (page 3 of 5)

Survey Form for Water users | ***W -1-*** | ***Date***

15. What is your perception of the water quality from the water district?

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative importance of each item.

	Strongly disagree 1.....	2.....	3.....	4.....	Strongly agree 5
1) Water is clear					
2) Water tastes good					
3) Water has bad smell					
4) There may be bacteria in the water					
5) There may be traces of heavy metals in the water					
6) There may be traces of chemicals in the water					

16. What is your perception about the safety of the water from the water district for the following uses?

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative safety of water for each use.

	Not at all safe 1.....	2.....	3.....	4.....	Very safe 5
1) Water is safe for drinking					
2) Water is safe for cooking					
3) Water is safe for bathing					
4) Water is safe for washing					
5) Water is safe for other uses (pls specify use) _____					

17. Does your household use water from other sources of water?

☐ 1) Yes (pls proceed to Q18)
☐ 2) No (pls proceed to Q19)

Appendix 9: Survey questionnaire for household water user respondents (page 4 of 5)[25]

Survey Form for Water users **W -1-** ***Date***

18. How does your household use other water sources?
Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative frequency of use for each water source.

Never use at all **1**..... **2**..... **3**..... **4**..... **Always use 5**

	Drinking	Cooking	Bathing	Washing
1) Bottled water				
2) Manual pump well				
3) Electric pump well				
4) Dug well				
5) Spring, lake, river, rain				
6) Others (pls specify) _____				

19. Are you aware that Mt. Apo is the source of water for your water district? ☐ 1) Yes ☐ 2) No

C. Information related to Mt. Apo

20. Are you aware that Mt. Apo is a water catchment area and the source of water for many areas in Mindanao? ☐ 1) Yes ☐ 2) No

21. Are you willing to pay PhP 25 per month in addition to your water bill to protect the water sources at Mt. Apo? ☐ 1) Yes ☐ 2) No

22. What is the maximum amount you are willing to pay per month, in addition to your water bill, to protect the water sources at Mt. Apo? ☐ Pesos/month

23. Are you willing to make a one-off payment of PhP 100 to protect water sources at Mt. Apo?
☐ 1) Yes ☐ 2) No

24. What is the maximum amount of one-off payment are you willing to make to protect water sources at Mt. Apo? ☐ Pesos

[25] The amounts indicated in Q21 and Q23 are the minimum of 10 bids for monthly payment and one-off payment, respectively. The maximum bid amount for monthly payment is PhP 250, with increments of PhP 25. The maximum bid amount for one-off payment is PhP 1000, with increments of PhP 100.

Appendix 9: Survey questionnaire for household water user respondents (page 5 of 5)

Survey Form for Water users | ***W -1-*** | ***Date***

25. If you indicated P0 (zero) in Q22 and Q24, please indicate your reason/s.

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative strength of influence of each item on your decision.

	Strongly disagree 1.....	2.....	3.....	4.....	Strongly agree 5
1) We are already paying too much for our water bill					
2) I do not believe that improved watershed management will ensure reliable water supply					
3) I think it is the government's responsibility to finance watershed protection					
4) I do not trust the organization that will manage the funds					
5) Only the rich people should pay					
6) Others (pls specify) _____					

26. How important to you are the following?

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative importance to you of each item.

	Not at all important 1.....	2.....	3.....	4.....	Very important 5
1) People are able to climb Mt. Apo					
2) People can safely drink water that comes from Mt. Apo catchment areas					
3) People can see the Philippine eagle or other rare plants and animals on Mt. Apo					
4) The Philippine eagle and other rare plants and animals live in Mt. Apo					
5) People are living on the footslopes of Mt. Apo					
6) Food crops are being grown on the footslopes of Mt. Apo					

Thank you very much for your time and cooperation ☺

Appendix 10: Survey questionnaire for climber respondents

Charles Darwin
UNIVERSITY

Darwin, NT 0909 Australia
www.cdu.edu.au
CRICOS 00300K

Survey Form for Tourists **T -1-** ***Date***

Please mark your answers with a tick (✓) in the appropriate box or write your answer in the box.

A. Socio-economic information

1. Where is your place of residence?

- ☐ 1) Magpet, North Cotabato
- ☐ 2) Makilala, North Cotabato
- ☐ 3) Bansalan, Davao del Sur
- ☐ 4) Sta. Cruz, Davao del Sur
- ☐ 5) Davao City
- ☐ 6) Digos City
- ☐ 7) Kidapawan City
- ☐ 8) Others (pls specify municipality and province or city)_____

2. What is your gender?

- ☐ 1) Male
- ☐ 2) Female

3. What is your age group?

- ☐ 1) 15yrs old or below
- ☐ 2) 16-25 yrs old
- ☐ 3) 26-35 yrs old
- ☐ 4) 36-45 yrs old
- ☐ 5) 46-55 yrs old
- ☐ 6) 56-65 yrs old
- ☐ 7) 66 yrs and older

4. What is your highest level of education?

- ☐ 1) No formal schooling
- ☐ 2) Some elementary
- ☐ 3) Elementary graduate
- ☐ 4) Some high school
- ☐ 5) High school graduate
- ☐ 6) Some college
- ☐ 7) College graduate
- ☐ 8) Post graduate
- ☐ 9) Vocational

5. What is your occupation?

- ☐ 1) Official of government and special-interest group, corporate executive, manager, managing proprietor or supervisor
- ☐ 2) Professional
- ☐ 3) Technician and associate professional
- ☐ 4) Clerk
- ☐ 5) Service worker and shop and market sales worker
- ☐ 6) Farmer, forestry worker or fisherfolk
- ☐ 7) Trader or related worker
- ☐ 8) Plant and machine generator or assembler
- ☐ 9) Laborer
- ☐ 10) Student
- ☐ 11) Others (pls specify) _____

Appendix 10: Survey questionnaire for climber respondents (page 2 of 4)

Survey Form for Tourists | ***T -1-*** | ***Date***

6. How much is your personal income before taxes?

Monthly income	Annual income
☐ 1) Below PhP3,333	1) Below PhP 40,000
☐ 2) PhP 3,333 – PhP 4,999	2) PhP 40,000 – PhP 59,999
☐ 3) PhP 5,000 – PhP 6,666	3) PhP 60,000 – PhP 79,999
☐ 4) PhP 6,667 – PhP 8,332	4) PhP 80,000 – PhP 99,999
☐ 5) PhP 8,333 – PhP 10,832	5) PhP 100,000 – PhP 129,999
☐ 6) PhP 10,833 – PhP 13,332	6) PhP 130,000 – PhP 159,999
☐ 7) PhP 13,333 – PhP 17,832	7) PhP 160,000 – PhP 189,999
☐ 8) PhP 15,833 – PhP 18,832	8) PhP 190,000 – PhP 219,999
☐ 9) PhP 18,333 – PhP 20,832	9) PhP 220,000 – PhP 249,999
☐ 10) PhP 20,833 – PhP 23,332	10) PhP 250,000 – PhP 279,999
☐ 11) PhP 23,333 – PhP 25,832	11) PhP 280,000 – PhP 319,999
☐ 12) PhP 25, 833 and above	12) PhP 320,000 and above

B. Information related to Mt. Apo

7. What mode/s of transport did you use to come here?

☐ 1) Public bus or jeepney
☐ 2) Private vehicle
☐ 3) Combination
☐ 4) Others (pls specify) _____

8. How long are you away from home for this trip? ☐ days

9. How many days do you intend to stay at Mt. Apo? ☐ days

10. How many people are in your travelling group? ☐ persons

11. What is the type of your travel group?

☐ 1) Family
☐ 2) Friends
☐ 3) Family and friends
☐ 4) School group
☐ 5) Organized group
☐ 6) Others (pls specify) _____

12. How much of the motivation for this trip is provided by climbing Mt. Apo? Please rate on a scale of 1 to 5 (1= not a motivation at all and 5 = only reason for the trip) ☐

Appendix 10: Survey questionnaire for climber respondents (page 3 of 4)[26]

Survey Form for Tourists **T -1-** ***Date***

13. How much do you expect to pay/spend on your trip (per person) for the following items?

Expense item	Expected expense (Pesos)
1) Entrance fee	
2) Transportation	
3) Food	
4) Accommodation	
5) Travel guide	
6) Others (please specify) _____	
_____	

14. If you were not here to climb Mt Apo right now, where might you be and what might you be doing?

Please assign a score of 1 to 5 to each item, utilizing the entire scale from 1 to 5.

	Highly Unlikely 1.....	2.....	3.....	4.....	Highly likely 5
1) Work					
2) Attend school					
3) Stay at home					
4) Visit other tourist site/destination (example: swimming at Paradise Island)					
5) Others (please specify) _____					

15. How many times have you visited/climbed Mt. Apo previously? ☐ time/s

16. Do you think you might be coming back to Mt. Apo at some time in the future?

☐ 1) Yes ☐ 2) No ☐ 3) Not sure

17. Are you willing to pay PhP 1000 climb fee per person for each visit/climb to Mt. Apo?

☐ 1) Yes ☐ 2) No

18. What is the maximum amount you are willing to pay for climb fee per person for each visit?

☐ Pesos/visit

[26] The amount indicated in Q17 is the minimum bid of 10 bids. The maximum bid amount is PhP 5500, with increments of PhP 500.

Survey Form for Tourists | ***T -1-*** | ***Date***

19. What motivates you to visit/climb Mt. Apo?

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative importance to you of each item.

	Not at all important 1.....	2.....	3.....	4.....	Very important 5
1) I like being outdoors					
2) I like climbing mountains					
3) I just want to climb Mt. Apo					
4) Mt. Apo is the highest mountain in the Philippines					
5) Mt. Apo is a sacred place					
6) There is a chance to see the Philippine eagle or other rare plants and animals					
7) I enjoy sharing a nature experience with family and friends					
8) Others (please specify) _____					

20. How important to you are the following?

Please assign a score of 1 to 5 to each item.
IMPORTANT: Please utilize the entire scale from 1 to 5 to show the relative importance to you of each item.

	Not at all important 1.....	2.....	3.....	4.....	Very important 5
1) People are able to climb Mt. Apo					
2) People can safely drink water that comes from Mt. Apo catchment areas					
3) People can see the Philippine eagle or other rare plants and animals on Mt. Apo					
4) The Philippine eagle and other rare plants and animals live in Mt. Apo					
5) People are living on the footslopes of Mt. Apo					
6) Food crops are being grown on the footslopes of Mt. Apo					

Thank you very much for your time and cooperation ☺