An economic valuation and the sustainable development of a marine protected area: A case study of Cu Lao Cham, Vietnam

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Abstract

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The Vietnamese shoreline stretches for over 3,200 km with over 3,000 islands but the marine and coastal resources of Vietnam are under increasing threat from human activities. This includes Cu Lao Cham (Cham Island Marine Protected Area (CLC MPA)), which is recognised as an important area in terms of biodiversity and fish stocks in Vietnam. The important habitats in CLC MPA, such as coral reefs, seagrass beds, rocky shore, and sandy bottoms in the waters surrounding the CLC, have been seriously over-exploited. This exploitation is blamed as the main cause of the decline in marine resources. Conservation efforts have recently been implemented in the CLC MPA. However, economic analysis of the CLC MPA's natural values has not yet investigated what may affect policy decisions on CLC MPA's sustainable development. An economic valuation of the CLC MPA marine and coastal resources can provide a framework to sustainably manage the allocation and use of the resources.

This study estimates the recreation and conservation values of marine resource in the CLC MPA using an onsite survey with a structured questionnaire. The Travel Cost Method was used to estimate the recreational values for respondents based on their visitation rate and their trips to the CLC MPA from 2013 to 2018. The results show that the respondents' visitation rate and trips are significantly affected by their socio-economic characteristics (such as income, household size, gender, occupation and education), their transport means to travel between home and the CLC MPA, and other factors (travel and other expenses, time and purpose for visiting CLC MPA). Empirical evidence from Zonal Travel Cost Models (the OLS log-log form) suggests that the relationship between the respondents' visitation rate and their travel cost is inelastic, which means that a change in the respondents' travel costs nominally affects their visitation rate. The findings from the zero-truncated Poisson count models reveal that the aggregate recreational benefits in 2018 from the CLC MPA are estimated to be approximately VND950 billion (US$42.4 million). The consumer surplus is overestimated if multi-destination trips are omitted from the demand model, with approximately a 2.7% difference.

The Contingent Valuation Method is used in this study to estimate the respondents' willingness to pay (WTP) for the conservation of the CLC MPA (paying additional entrance fees). The results from Generalised Linear Models show that the WTP estimation varied among three different groups of respondents (combined, Vietnamese, and foreign visitors). Foreign respondents were willing to pay the highest amount and Vietnamese respondents pay the lowest amount (US$3.56 and US$1.99 per person per visit, respectively). On average, respondents visiting CLC MPA were willing to pay US$2.26 per person per visit.

Keywords: Individual Travel Cost, Zonal Travel Cost, Contingent Valuation, Payment Card, Willingness to Pay, Cu Lao Cham, Marine Protected Area

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Table of Contents

List of Tables

List of Figures

Abbreviations

ADB	Asian Development Bank
APN	Asian-Pacific Network for Global Change Research
CLC	Cu Lao Cham
CS	Consumer Surplus
CVM	Contingent Valuation Method
DBDC	Double-bounded Dichotomous Choice
FAO	Food and Agriculture Organisation
ITCM	Individual Travel Cost Method
IUCN	International Union for Conservation of Nature
MOFI	Ministry of Fishery (Vietnam)
MPA	Marine Protected Area
OLS	Ordinary Least Squares
TCM	Travel Cost Method
TEV	Total Economic Value
WTA	Willingness to Accept
WTP	Willingness to Pay
ZTCM	Zonal Travel Cost Method

Chapter 1
Introduction

1.1 An Overview of the World's Coasts and Marine Resources

Two-thirds of the Earth's surface is covered by oceans and the oceans' resources are diverse. There are valuable varieties of fauna and flora dependent on the sea (Hallwood, 2014). Coastal estuaries, a combination of fresh and saltwater, form coastal and estuarine wetlands and are some of the most productive habitats on earth. These habitats are vital in terms of fish hatcheries (Cicin-Sain, Knecht, Jang, & Fisk, 1998; Hallwood, 2014). The abundance of fish and other marine life in coastal areas is of great value, economically and ecologically, to coastal nations (Cicin-Sain et al., 1998). Fish from coastal and oceanic water generates the largest harvest of wild food sources on earth (Hinrichsen, 2011). Fishery yields rose dramatically in coastal areas under national jurisdiction between the 1950s and 1990s (Cicin-Sain, 1993). According to the Food and Agriculture Organisation (FAO, 2018), global marine fishery catches accounted for 87% of all the fish caught in 2016 (79.3 million tonnes).

Marine and coastal ecosystems protect natural habitats and human beings (Berkes, 2015; Emerton, 1999). The marine environment and coasts are also unique in an economic sense. They support economic activity by providing raw materials, food, tourist and leisure destinations, coastal livelihoods and services (Berkes, 2015; Cicin-Sain et al., 1998; Emerton, 1999). For example, the coastal and estuary ports and harbour facilities generate significant monetary benefits via waterborne trade. Seacoasts and river estuaries also support industrial activities, through providing cooling water for power generation plants (Cicin-Sain et al., 1998). Moreover, coasts are greatly valued and enormously attractive for recreation, including holiday resorts and tourist destinations (Cicin-Sain et al., 1998). Global tourism has grown by nine percent each year since the mid-1980s. The coastal and marine tourism is the fastest growing sector of the travel and leisure industry, contributing five percent of global gross domestic product (GDP) in 2014 (Cicin-Sain, 2014; Hinrichsen, 2011; Rangel-Buitrago et al., 2019).

To date, offshore oil deposits are the most valuable ocean resource. According to the U.S. Energy Information Administration, in 2015, there were more than 27 million barrels of offshore oil produced per day. This figure represents approximately 30% of the total global oil production (Manning, 2016). Other mineral resources such as polymetallic nodules are widely scattered across the ocean bed. Ocean beds also house submarine cables and pipelines that are governed by legal rules (Hallwood, 2014). Coasts and oceans generate energy from gas, wind, tides and waves. By 2013, wind power from turbines in the sea were generating over 6.562 gigawatts of electricity in Europe and 565 megawatts in China. The U.S. is expected to reach 54 gigawatts offshore wind power by 2030. By 2020, this worldwide figure for offshore wind power is expected to reach 75 gigawatts (Bhardwaj, 2015). Tides, waves and temperature gradients from seas and oceans are considered massive potential energy sources because the world's seas and oceans are vast. Scientists have estimated that, using current technologies, the oceans could generate anywhere between 8,000 and 80,000 terawatt hours of electricity per annum from wave energy, 2,200 terawatt hours from tidal currents and 10,000 terawatt hours from ocean thermal (temperature) gradients (Hinrichsen, 2011).

The oceans are also considered great reservoirs as they absorb and recycle greenhouse gases, like carbon dioxide. They also trap heat from the atmosphere which reduces the impact of global warming (Hinrichsen, 2011). Approximately 4,000 Gigatonnes of carbon sequestration have been absorbed by the oceans over recent decades (Monaco & Prouzet, 2014).

Although marine resources and coastal ecosystems support economic activity, they have been negatively affected by human development. Intensive globalisation has generated more environmental pressure on coastal areas and fishing grounds. These pressures include population growth and movement, urbanisation, the development of multi-industries and trade development and liberalisation, and transnational corporate activity and people's lifestyle (Turner, Bateman, & Adger, 2001). Eppink, Brander, and Wagtendonk (2014) indicate that urban expansion, development driven by population growth (including tourism), increased agricultural production and overfishing have all affected socio-economic development of coastal areas.

Importantly, aquaculture and mariculture have grown over recent decades. This has coincided with declining capture fisheries. Though farming fish and shellfish has its benefits, it has created its own social and environmental problems. Mangroves, tidal creeks and estuaries - habitats that traditionally provided a rich variety of seafood for small-scale fisheries in the Philippines, for instance - have been cleared to create privately owned fishponds, pens and cages (Hinrichsen, 2011).

Human activities (manufacturing and consumption) have also negatively affected marine habitats and resources by exploiting exhaustible resources, partially transforming them into other uses (such as aqua-farming), and discharging wastes and emissions into the air, land and sea; all of these emissions ultimately end up in the ocean (P. Christie & White, 1997; Emerton, 1999). According to Hinrichsen (2011), an estimated 80% of global marine pollution comes from land-based sources. Untreated or partially treated industrial and municipal waste from coastal urban areas is dumped directly into the sea. In addition, toxic particles and chemicals from untreated sewage and municipal waste, industries and agriculture flows into rivers and streams and pollutes coastal waters. For example, nitrogen and phosphorus from farmlands are washed into inland runoffs before reaching the ocean (Hinrichsen, 2011).

Hinrichsen (2011) and Scura, Chua, Pido, and Paw (1992) show that migration movement have been observed in the world's coastal areas, which has profound consequences for the coastal and near shore environment. The figures for Asia are extraordinary. Every day, nearly a thousand people move into China's large coastal cities, such as Shanghai, Tianjin, and Shenzhen. Similar numbers are heading to urban coastal areas in Vietnam, the Philippines, Cambodia, Thailand and Bangladesh (Hinrichsen, 2011). Globally, in 2018, there were 168 coastal cities with populations of over one million people; 145 cities have populations between one and 10 million, 15 cities have 10 to 20 million people, and eight mega-cities have over 20 million people (Siegel, 2020). The stress on coastal areas has become more noticeable as the human population grows; watersheds become degraded and drained, and fisheries have become overexploited (P. Christie & White, 1997).

Approximately half of the world's population, some 3.2 billion people, live along or within 200 km (124 miles) of a coastline (Cicin-Sain, 2014; Berkes, 2015; Kay & Alder, 2005). As natural centres of commerce and trade, coastal towns quickly evolved into cities. The problem of high coastal population density (from 80 to 1,000 people per square kilometre) is compounded by the popularity of these regions as holiday destinations, resulting in additional seasonal pressure on water resources and the natural environment, as well as generating enormous quantities of waste (Hinrichsen, 2011). The clearest sign of population growth in coastal regions is the accelerating rate of urbanisation. Kay and Alder (2005) show that developing countries comprise most of the urban centres where there is a high birth rate. Debates on the allocation and planning issues are common in discussion of urbanisation in the context of public versus private access to beaches and the seashore. Urbanisation affects the visual landscape and creates increased pressure on coastal areas and the marine environment. It also influences marine freight and sewage. In addition, the pollution of coastal waters from human activities can dramatically decrease fish production and degrade marine nursery grounds, other valuable wetlands and coastal habitats (Cicin-Sain et al., 1998).

As the world's climate changes, sea levels are rising inexorably. Recent decades have recorded some of the worst and most destructive extreme weather events (for example, hurricanes/cyclones/typhoons, river-borne flooding, rogue waves, landslides or mudslides, dust storms, and heat waves). Ocean acidification has been increasing; this negatively affects the poles or "marine calcifier" organisms such as reef-building corals, molluscs, crustaceans, as well as many species with skeletons and some species of algae (Hinrichsen, 2011).

1.2 Coasts and Marine Resources in Vietnam

1.2.1 Natural Characteristics

The Vietnamese shoreline stretches along the country from north to south, and covers over 3200 km. The coastal waters, which are 50 m deep or less, occupy an area of about 206,000 km^2 with 1,600 km^2 of over 3,000 islands. The Vietnamese coastal zone can be divided into four natural parts. They are the Gulf of Tonkin, the central coast, the southeast coast, and the Gulf of Thailand (Thanh et al., 2004).

There are 114 rivers along the Vietnam coast. The Mekong River in the south and the Red River (Song Hong) in the north are the first and second largest river system in Vietnam. Approximately 214 million tonnes of sediment are discharged from these two river systems every year (Thanh et al., 2004). These sediments have formed two large deltas that are used extensively for agricultural and fishery production (Ministry of Fishery [MOFI], 2005). In addition to these two river estuaries, many bays and lagoons have been formed because of the natural interaction between the sea and the land. Thus, biodiversity in Vietnam coastal zone has been enriched by the high productivity of the estuaries, lagoons, and 20 other types of tropical ecosystem such as mangrove forests, coral reefs, seagrass beds, tidal marshes, mudflats, and sandy areas. Approximately 11,000 aquatic and over 1,300 island species inhabit the coastal zone, including many rare and precious endemic species (Ministry of Natural Resources and Environment Vietnam, 2003; Thanh et al., 2004)

Scientist have identified over 400 coral species living in the waterways of Vietnam. These include the Acroporidae (117 species), Faviidae (42 species), Fungiidae (32 species), Poritidae (31 species) and Dendrophylliidae (25 species) families (Tac-An et al., 2013). Coral reefs are important coastal habitats and are found around islands such as Cu Lao Cham and Hon Mun. They stretch along the shoreline from Da Nang to the Binh Thuan province (Asian-Pacific Network for Global Change Research [APN], 2011). According to Burke, Selig, and Spalding (2002) the southern reefs are the most diverse forming both fringing and platform reefs. Traditional marine fishing, navigation, tourism and urbanisation in coastal regions and the threat of weather/climate change generate significant pressure on the quality of coral reefs in Vietnam's marine areas (Burke et al., 2002). As a result, the coral reefs have been degraded and their biodiversity (including reef fish) has also significantly declined (Tuan, Yet, & Long, 2005).

Vietnam's long coastline and the Ca Mau Cape have the potential to support a substantial mangrove forests. Before the second Indochina War (1962 – 1971), mangrove forests in Vietnam covered an estimated 400,000 ha; 250,000 ha of these forests were found mainly in the south. Among the south mangrove forests, approximately 200,000 ha were in the Ca Mau peninsula (an estimated 149,982 ha were primary forests) and 40,000 ha were in the Sat Forest, Bien Hoa province and Saigon (Ho Chi Minh City) (Hong & San, 1993).

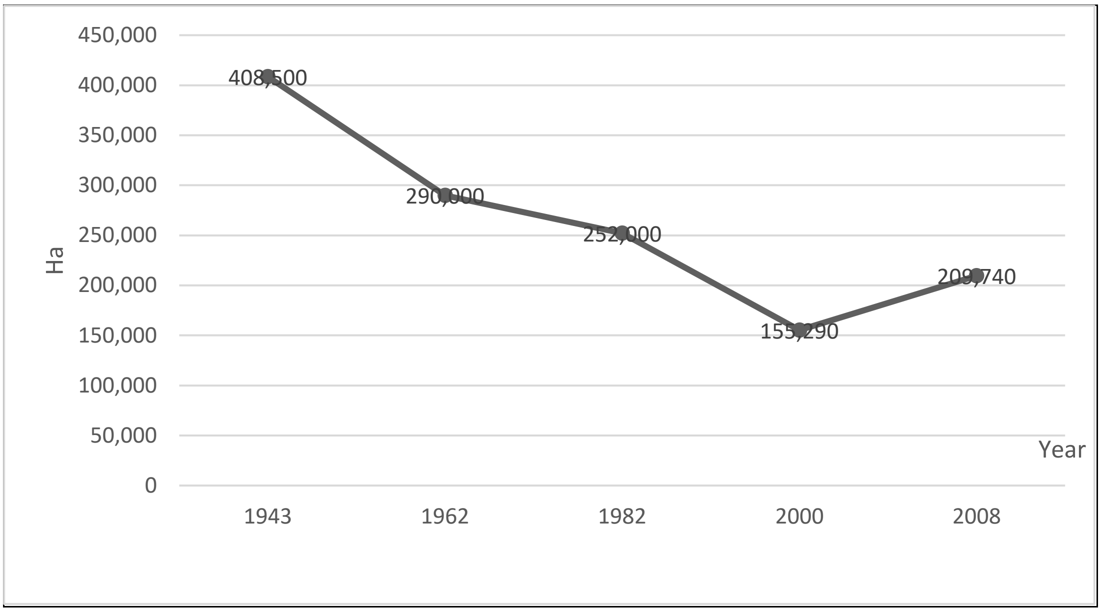

Figure 1.1 The mangrove forest area of Vietnam (1943 – 2008) (Que et al., 2012).

Vietnam lost 48.5% of its mangrove forests between 1943 and 2008 (see Figure 1.1), with an average annual loss of 3,200 ha (Que et al., 2012). The main reason for the decline in mangrove forests were the use of herbicides and napalm during the second Indochina War (1962 – 1971) in southern Vietnam, and exploitation for resources or agricultural and shrimp farms in other areas (Hong & San, 1993). In the 2000s, the growth of mangroves has increased compared with the 1990s, but this is mostly secondary forest. This increase was the result of mangrove restoration projects and government programmes (Que et al., 2012).

1.2.2 Coastal Socio-economic Activities in Vietnam

The Vietnam coastal areas are densely populated. Activities, such as fishing, marine transport, tourism and other related industries, contribute greatly to Vietnam's Gross Domestic Product (GDP) (Sekhar, 2005). In 2015, marine and coastal industries contributed 18.8% to Vietnam's GDP (approximately 28.9 million USD). Returns from offshore oil and gas extraction, and services (navigation and tourism) account for approximately 70% of the total marine economic activities (Ha, 2015).

In Vietnam, the marine catch across 15 large fishing grounds (MOFI, 2005) (see Figure 1.2) increased approximately eight-fold between 1980 and 2017 (391,000 tonnes to approximately 3.2 million tonnes) (FAO, 2019). While, fishery resources within Vietnam's exclusive economic zone have decreased, the fish catch has increased from 1990 to 2010 (Japanese International Cooperation Agency, 2013). The overall catch-per-unit effort has dramatically decreased: between 1981 – 2005, it dropped from 1.11 to 0.35 tonne/horsepower/year. These figures indicate the poor status quo and serious depletion of the fish stock. In addition, fishermen have recently prefer to use small-mashed fishing net with causes fish stocks to decline faster (MOFI, 2005). Lai, Tuan, Thuy, Tri, and Van (2009) contend that Vietnam's fisheries are in a state of overfishing.

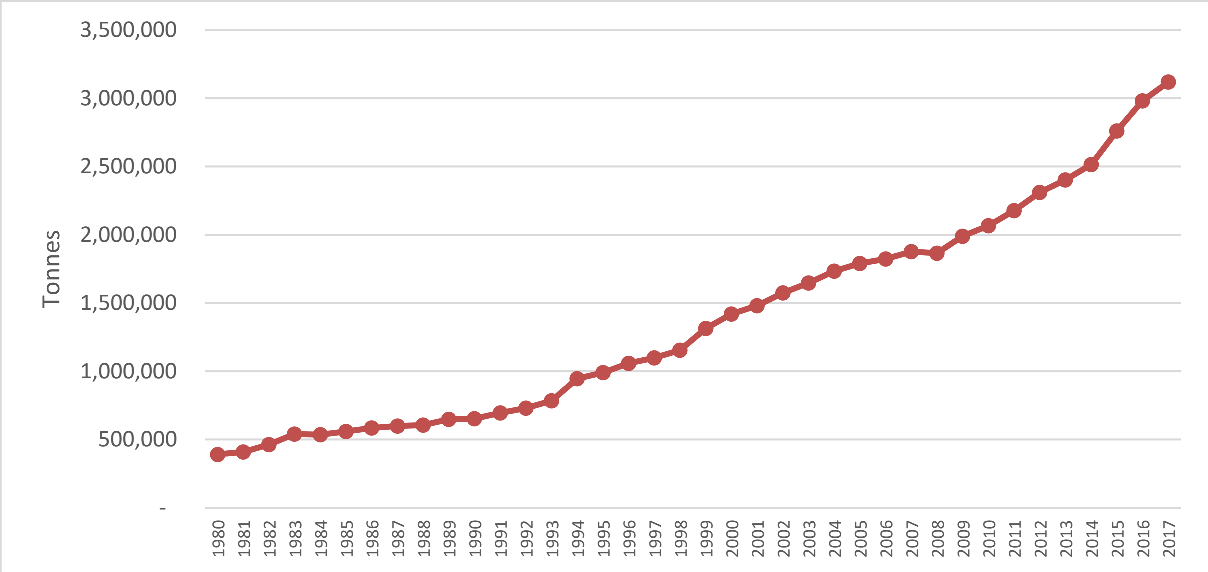

Figure 1.2 The annual marine fish catch in Vietnam (1980 – 2017) (FAO, 2019)

Coastal areas represent over 70% of the total recreational and tourist destinations in the country. They attract 80% of the total number of visitors per annum. The tourism industry in Vietnam has grown dramatically since the 1980s, especially in coastal regions. An intensive seasonality and regionality are two typical characteristics of coastal tourism in Vietnam. The use of coastal resources becomes highly competitive during the tourism season. In term of regional tourism, most visitors gather in only a small number of destinations and hotels/resorts, which generates huge pressure on those coastal areas, contributing to the depletion of the coastal resources and affects their value. Water quality at tourist destinations and beaches is polluted as untreated waste and wastewater is often discharged from visitors, hotels, restaurants, boats and ships (Sekhar, 2005).

Vietnam's coastal resources generate benefits for economic development as a result of easy access and high biodiversity. However, human activities (industrialisation and urbanisation) negatively affect coastal ecosystems, particularly those near the seashore. Coastal habitats receive large quantities of chemicals and pollutants through river systems, which harm both marine and coastal ecosystems and human activities in the long term. Marine waters have also been affected by dredging activities, soil erosion in water flows due to deforestation, and wastewater from industrial, agricultural and urbanisation activities. These factors increase suspended solids and harm to coral reef habitats. Other activities, such as the development of offshore oil and gas and related increases in shipping activities, pose a serious threat to Vietnam's coastal ecosystems (Sekhar, 2005).

The Vietnam coast is also subject to natural disasters. Hurricanes periodically strike central coasts resulting in the loss of life and devastating these areas for many years (Sekhar, 2005). The pressure on coastal resources has increased through a combination of natural disasters, climate change, dramatic population growth and strong economic development. These features all contribute to the unsustainable harvesting of natural resources, increased environmental pollution and decreased productivity of these resources (Thang et al., 2011).

Although coastal districts contribute to the country's economic development, they represent approximately 14% (1.8 million people) of the poorest communities in Vietnam. These poor communities, mostly in the central and north central coast, are vulnerable to flooding and damage from hurricanes, which also limits their access to markets, and social and education facilities. These communities' living conditions have not improved because most of them rely on low-yield fishing, aquaculture and agriculture. Poverty remains the most serious problem in coastal communities in Vietnam (Asian Development Bank [ADB], 2002). Economic development, unsustainable utilisation and exploitation, and the poor management of marine resources, have all seriously impacted the coastal environment of Vietnam and created many social problems.

According to Thang et al. (2011) there are four main environmental threats to coastal sustainability. First, coastal resources have been used unsustainably, as illustrated by the decrease in fish stocks, the degraded water quality and depletion of other natural resources such as minerals. Secondly, marine and coastal ecosystems have been damaged by human activities and natural phenomena such as the degradation of coral reefs, sea grass meadows and mangrove forests. The protective function of these ecosystems (against from losses and floodings from hurricanes) has seriously decreased in the second half of the twentieth century. Thirdly, there is an influence from water and soil pollution by human activities and natural disasters on coastal sustainability. Lastly, population growth and coastal shareholders' conflicting interests have also increased pressure on the coast and its landscape. Other threats are also impacting Vietnam's coasts and resources, including climate change and rising sea levels.

Burke et al. (2002), Sekhar (2005) and Thanh et al. (2004) identify specific threats to marine and coastal resources in Vietnam, such as upstream deforestation; the construction of dams; and waste and pollutant dumping from agricultural, industrial and urban activities. The widening of the offshore oil and gas industry, coastal mining, tourism, navigation, excessive aquaculture and destructive fishing practices (the use of dynamite, electricity or toxic chemicals) present significant dangers to coastal ecosystems (APN, 2011; Sekhar, 2005). The development of seaports along the Vietnam coastline has increased pressure on coastal ecosystems, especially sensitive and valuable estuary ecosystems. The widening of the Cai Lan port (Quang Ninh province) in 2015, accompanied by its onshore facilities, has destroyed 359 ha of mangrove forests, 47 ha of beaches and tens of hectares of seaweed along the coast. Dredging activities in Da Nang have degraded the coral reefs along the central coast. Oil and waste from ships and port construction waste have been discharged into the seawater and coastal area from the north to the south of the country, which has polluted the water, air and soil (Ministry of Natural Resources and Environment Vietnam, 2015).

According to Hinrichsen (2011) the creation of shrimp ponds has led to the loss of 70-80% of Vietnam's natural mangrove forests, resulting in depauperate coastal ecosystems and environment. As the flood protection function has diminished, the catches of fish and shellfish have declined. Many significant, valuable coastal ecosystems have been over-exploited; marine biodiversity has seriously declined. The government is facing difficulty in preventing the loss of marine biodiversity as a result of ongoing economic development (Nam & Son, 2001).

In April 2016, a marine life disaster affected the Vietnam central coast. Millions of dead fish were washed up along approximately 200 km of coast in four provinces (Ha Tinh, Quang Binh, Quang Tri and Thua Thien Hue). Marine resources on Ha Tinh's coast were the most significantly damaged: this region is the country's most vulnerable and poorest area with a high proportion of the population reliant on fishing and aquaculture. Farm-raised fish, shrimps and clams in this region were severely damaged. The incident disrupted the livelihood of fishermen and aquafarmers in these four provinces (Loc, 2016). On June 30, 2016, Vietnam's government announced that toxic discharges from a Taiwanese-owned steel plant (Formosa Steel Plant) were responsible for this environmental disaster and the associated decline and tourist numbers and fishery catches in the four provinces (Minh & Wright, 2016).

1.2.3 Marine Protected Areas in Vietnam

Nam, Son, and Cesar (2005) contend that the establishment of Marine Protected Areas (MPAs) is one way that Vietnam can safeguard valuable ecosystems within their confines. However, the International Union for Conservation of Nature (IUCN, 2004) notes that "MPAs are unlikely to be sustainable unless they make economic sense and generate benefits that are at least equal to the costs they incur" (p. 65). An economic valuation of MPAs, along with their biological and ecological values, is necessary for the development of a framework, which ensures the efficient utilisation of marine and coastal resources in the context of social welfare based on public policy. Economic valuations provide a summary of the benefits associated with resource allocation; this information can be used to design sustainable measures to ensure the protection of marine resources in the MPAs. Policy makers must be given all the relevant information about economic decisions and activities that influence the state and integrity of the MPAs (Emerton, 1999), as this will enable them to make informed decisions (Lipton, Wellman, Sheifer, & Weiher, 1995).

MPAs have many benefits. They help: (a) protect biodiversity; (b) ensure the sustainable use of components of biodiversity such as ecosystem biodiversity, species biodiversity and genetic biodiversity; and (c) manage conflict, enhance economic and social well-being (UNEP, 2004). As the management of marine resources becomes more integrated and holistic, MPAs will significantly contribute to the conservation of marine and coastal resources. MPAs, and their terrestrial ecosystem counterparts, can be used to protect habitats from threats and danger and to bolster the recovery of biological communities and ensure their continued productivity. The establishment of MPAs may also motivate communities to increase their participation or involvement in ocean management. For example, they contribute in policy decision on stricter land use or pollution control (National Research Council, 2001).

As a part of Vietnam's Sustainable Development Strategy, on 26 May, 2010, the Prime Minister issued Decision No. 742/QD-TTg to establish 16 marine conservation zones. Six of these MPAs (Nha Trang, Cu Lao Cham, Phu Quoc, Con Co, Con Dao and Cat Ba) were officially demarcated. The establishment and implementation of these zones was expected to significantly contribute to the socio-economic development of the provinces where the conservation zones are located. The establishment of these MPAs was expected to generate new jobs and sources of income, which, in turn would improve the livelihoods of coastal communities that rely primarily on marine resources. In addition, the establishment was designed to reduce the exploitation of resources, enhance the protection of marine environment and ensure sustainable aqua-farming within the region (Mangroves for the Future Vietnam, 2015).

1.3 The Cu Lao Cham Marine Protected Area

1.3.1 Physical Environment Characteristics and Natural Resources

The Cu Lao Cham MPA (CLC MPA) was established on the 20th of December 2005, under Decision No.88/2005/QD-UBND of the Provincial People's Committee of Quang Nam. The aim was to conserve marine natural resource biodiversity, environmental and cultural-historical values, improve community livelihoods, protect and effectively exploit ecosystems to ensure sustainable development (Trinh, 2006). The CLC archipelago consists of eight islands (Hon Lao, Hon Dai, Hon Mo, Hon Kho Me, Hon Kho Con, Hon La, Hon Tai, and Hon Ong) which lie 18 km offshore from Hoi An, an ancient town. The archipelago is located from 15° 52' to 16° 00'N and from 108° 22' to 108° 44'E in the eastern part of the Quang Nam province (Walton et al., 2014). This area is known for its tropical monsoon climate. The temperature is stable with an annual difference of 6 to 7 ^{0}C (Nhung, 2010). In addition to its natural beauty, the CLC has an abundance of traditional/local knowledge and customs, archaeological site, forest resources and medicinal plant resources (Tuan et al., 2004).

The CLC MPA includes both protected marine waters and island nature reserves. The terrestrial area covers 5.95 km^2 of protected forest and 7.9 km^2 of rehabilitation forests. The marine component covers 16.5 km^2 of coral reef and 5 km^2 of seagrass beds (Walton et al., 2014). The MPA was established to control the locals and seasonal visitors' use of the islands (Babcock, 2012).

There are 10 beaches in the CLC. These are located mainly in the western section of the archipelago. They are Bai Ong, Bai Bac, Bai Lang, Bai Xep, Bai Chong, Bai Bim, Bai Huong, Bai Nan, Bai Ruong and Bai Tra. The purest and prettiest beaches voted by local communities are Bai Chong, Bai Bim, Bai Ong, Bai Bac, Bai Xep and Bai Nan (Trinh, 2008b). According to Trinh (2008b) and Walton et al. (2014), the CLC MPA covers an area of 235 km^2. The functional zones of the CLC MPA under the Decision 88/2005 QD-UBND (see Figure 1.3) include the

- core or strictly protected zone (the red area in Figure 1.3) (1.26 km^2). All activities (coral collection, diving, snorkelling, fishing and swimming) are permanently banned in this zone;
- ecological rehabilitation zone (2.25 km^2) (the blue area in Figure 1.3). In this area, certain activities (construction, anchoring in coral reef areas and any kinds of resource harvesting) are forbidden;
- tourism development zone (1.39 km^2) (the yellow area in Figure 1.3). In this area, tourist activities may be developed to generate income for local communities and under the control of the MPA Management Board; these activities include scuba diving, sailing, research and education, coral reefs watching via glass bottom boats;
- sustainable exploitation zone (94.58 km^2) (the white area in Figure 1.3). Fishing using suitable methods and aquaculture production are allowed to enable local communities to generate income;
- community development zone (1.3 km^2); and a
- buffer zone (120.02 km^2) (the light blue area in Figure 1.3).

The CLC MPA is recognised as an important area, both in terms of marine biodiversity and for fisheries in Vietnam. It includes important coral reefs, seagrass beds, rocky shores, and sandy bottoms in the surrounding waters of the CLC islands. It hosts 277 coral species, 270 reef fish species, 76 seaweed species, 5 sea grass species, 4 lobster species, 97 molluscs, and 16 echinoderm species (Long et al., 2008).

Furthermore, small beaches along Bai Bac, Bai Ong, Bai Lang, Bai Chong, Bai Bim and Bai Huong are considered important spawning grounds for sea turtles. However, local residents have not observed sea turtles in these areas for a decade. The outer waters of the beaches, which feature seaweed provide a home and food supplies for sea turtles and dugongs (Long et al., 2008).

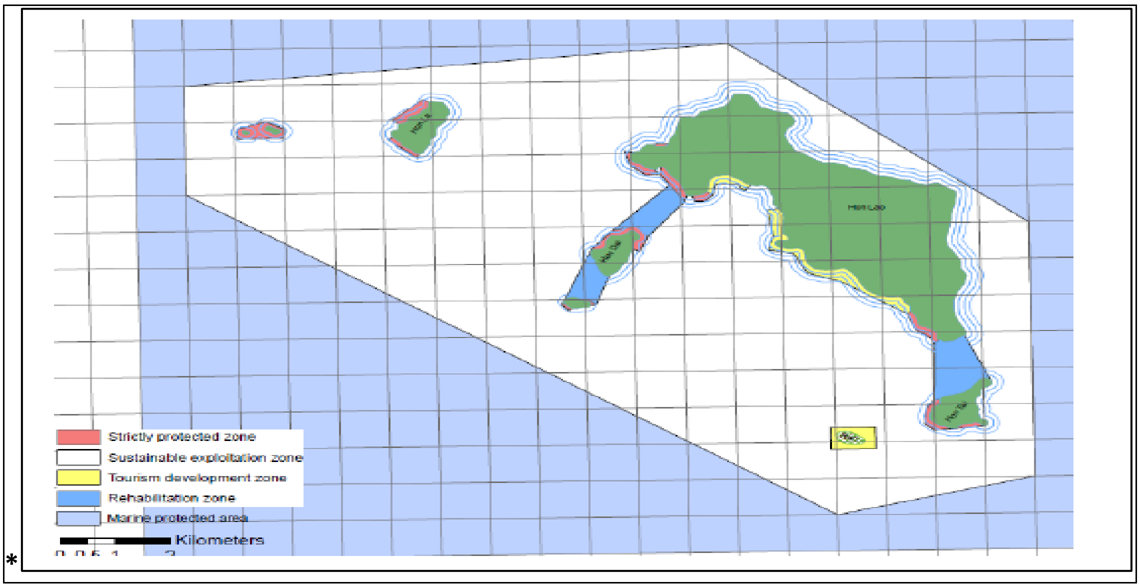

Figure 1.3 The CLC MPA functional zones (Trinh, 2006)

The CLC MPA was also established to protect forest resources and medicinal plants. According to Trinh (2006), there are 288 species from 107 families of higher vascular plants or medicinal plants on Hon Lao, the main island of the CLC MPA. The plants include Polypodiphyta (five species from five families); Pinophyta/Gymonospermae (three species from three families) and Magnoliophyta/Angiospermae (280 species from 99 families). A population of 100,000 swiftlets (*Collocalia francica*) have been observed in caves on the islands of Hon Tai, Hon Kho, Hon La, Hon Ong and eastern Hon Lao (Trinh, 2008b).

1.3.2 Livelihoods

Hon Lao is the largest and only inhabited island in the CLC archipelago. It has a total area of approximately 1,549 ha. There is only one commune on this island, Tan Hiep, which consists of four villages; Bai Lang and Bai Huong are the two largest villages. In 2011, the total population was 3,000 people spread over 600 households. Eighty percent of the island population resides in Bai Lang (Ngoc, 2018).

In the CLC MPA, fishing is the main source of income for most household. According to a community survey conducted in August 2007, approximately 85% of household heads' occupation was a fisherman (Nhung, 2010; Tri, 2007). Those who are not fishermen were still involved in some form of business associated with fishing. A small number of residents on the island were fish traders, a few others were fish processors and a few households were involved in fish drying. The most common non-fishing related occupations in these villages were small shop sellers or traders, wood collectors, construction persons, livestock raisers (typically women), and professions associated with the local government, coastguard and schools (P. Brown, 2011).

Land crab harvesting has become a recent local development in the CLC MPA since 2009. In 2013, a group of 37 residents (12 full-time employees) were involved in harvesting land crabs. Land crabs are sold to residents and visitors for food or for presents. In 2013, the community established a community board for land crab protection and sustainable harvesting to limit the number of land crabs harvested. No gravid crab may be taken during the harvest season and all crabs must be bigger than seven centimetres (Trinh, 2014a).

1.3.3 Tourism Activities

Since 2009, when the CLC MPA was designated as a UNESCO biosphere reserve, the number of visitors has sharply increased (Walton et al., 2014). The total number of people who visited the CLC MPA in 2018 was twenty times higher than in 2008 (see Table 1.1) (Nguyen, 2019). Majority of the increase was from domestic visitors. The percentage of domestic visitors increased from approximately 61% to over 80% of the total visitors to the CLC MPA during this period. In 2014, the tourist activities in the CLC MPA generated approximately US$210,000 (Walton et al., 2014).

Table 1.1 The number of visitors to CLC MPA (2008 – 2018)

	Domestic visitor	International visitor	Total
2008	12,376	7,784	20,160
2009	26,510	8,123	34,633
2010	30,948	12,165	43,113
2011	56,000	14,000	70,000
2012	77,989	27,085	105,074
2013	156,578	38,422	195,000
2014	175,826	46,222	222,048
2015	282,634	84,914	367,548
2016	322,488	79,699	402,187
2017	323,930	83,385	407,315
2018	334,542	65,140	399,682

Source: Trinh (2014b), Nguyen (2019)

Despite the increased number of visitors, there were few interactions between local residents and visitors regarding social communication and increased businesses opportunities for local communities (P. Brown, 2011). Only small numbers of private houses have been transformed into homestays for visitors. Some locals have been hired by scuba diving agents at Bai Chong Beach. However, the majority of diving visitors have no opportunity, or very few opportunities, to interact with the local community because th diving area is remote from the island villages. The visitors' impact on the locals' livelihoods is thus minimal (P. Brown, 2011). As a MPA, no hotels are permitted on the island. This regulation ensures that visitors will use homestays and experience the local culture (Babcock, 2012).

Tourist activities in the CLC MPA include swimming, snorkelling, scuba diving and parasailing. Fishing and squid fishing at night attract domestic visitors. Watching wildlife in terrestrial areas is a popular visitor activity. There is no trekking or hiking routes on the island because of security concerns.

1.3.4 Conservation Challenges in the CLC MPA

Vietnam's coastal zone is currently experiencing critical changes to its natural resource management. Rural coastal environments are traditionally considered to be marginal landscapes, the domain of poor coastal fishermen and others whose livelihoods are associated with the exploitation of open access resources. The development of tourism, aquafarming and other industries such as port construction or navigation have all contributed to the recent transformation of the coastal zone, as part of the development driven by Vietnam's significant recent economic reforms and growth (P. Brown, 2011).

The landscape and marine resources in the CLC MPA face similar pressures from development. Trinh (2008b) identifies nine threats to the primary marine resources and coral reefs in the CLC MPA. These are destructive fishing, the over exploitation of marine resources, water pollution, the vast growth in the distribution of the crown of thorns starfish (*Acanthaster planci)*, the construction of ship ports, other construction, sand mining, fishing using small-meshed nets and high powered boats and waste pollution.

In the CLC, fishing activities mostly take place onshore. Nearly 60% of the total fishery catch is from the sandy-muddy seabed where seagrass is located. The remaining amount comes from deep water offshore (26.6%), and onshore reefs (9.7%). In short, fish catch activity mostly comes from sensitive ecosystems such as coral reefs or seagrass (70% of the total catch) (Trinh, 2008b). The natural resources and biodiversity in the MPA have decreased because of the absence of environmental protection measures. The fishermen from the CLC MPA and other provinces are responsible for the decrease in these marine resources. The marine resources are over-exploited, not only to supply the locals' subsistence livelihood, but also for live fish markets, from which the fish is sold to nearby restaurants and exporters on the mainland, especially Danang (MOFI & Danida, 2005).

Coastal resources around the CLC MPA have been seriously over-exploited. This is the main cause of the decreasing biodiversity in the CLC MPA. The high demand for live edible fish, unsustainable fishing methods and near-shore reef fishing by poor residents all contribute to over-exploitation of marine resource. On the west side of the CLC, there are very few large fish. The conditions of the reefs and seagrass beds have also been altered. Local fishing fleets are diverse in terms of their boat size and the fishing gear they use. This means that all boats target different species of fish and harvest in different area. Hence, the MPA management investigation and action for environmental protection should specifically address local habitats, fisheries, individual species, and protection requirements (MOFI & Danida, 2005).

The construction of new roads on Bai Bac and Bai Bim, and the port bridge in Bai Huong has affected the surrounding beaches (Trinh, 2008b). The islands in the CLC MPA act as shelter for large cargo vessels and enable them to avoid damage and the effects of typhoons or hurricanes. The lack of waste collection stations at these ports means that garbage and waste is often discharged into the sea. Physical damage to the seabed from ships' weighing anchor onshore is also a major concern (MOFI & Danida, 2005).

Domestic waste also has a major impact on the beach environment and marine resources in the CLC MPA (Long et al., 2008; Trinh, 2008b). According to Trinh (2008b), in 2005, there was approximately one million tonnes of waste (mostly organic waste) discharged on the beach, at the landfill or into the water around the CLC archipelago. Domestic wastewater is directly discharged into the sea and garbage is a growing problem with a high concentration of plastic garbage (MOFI & Danida, 2005). Long et al. (2008) indicate that some diseases found in the reefs came from residents' waste released on the beaches. These diseases present a threat to the life and development of coral reefs, seagrass and other marine creatures in the CLC MPA (Tin et al., 2019).

Habitat destruction and degradation, declines in marine productivity, the loss of biodiversity and the population of coastlines are problems confronting the CLC MPA. For example, Tin et al. (2019) indicate that seagrass beds in the CLC MPA have undergone significant changes between 2003 – 2017 as result of marine pollution, changes in natural conditions and human activities. Sustainable development is now required to ensure a healthy coastal environment and marine resources. In coastal zone, economic development and marine protection are inter-dependent (MOFI & Danida, 2005). Moreover, the protection of coral reefs and related habitats in the CLC MPA provides benefits for the fisheries and tourism (Trinh, 2008a; MOFI & Danida, 2005). However, these benefits can only be realised in the medium to longer-term (MOFI & Danida, 2005) under good management practices.

To ensure the sustainable development of the CLC MPA, we need economic analysis of marine and coastal resources as well as terrestrial resources. This information would ensure the development of efficient strategies for conservation (Bräuer et al., 2006). The MPA management and conservation policy is reflected in the various forms of perceived and realised costs and benefits associated with marine resources (Ahmed, Chong, & Cesar, 2005).

1.4 Research Objectives and Questions

1.4.1 Research Problems and Objectives

Previous studies on the CLC MPA have examined biodiversity, resource utilisation, conservation potential (Long, Tuan, Ben & Hoang, 2006; Long et al., 2008; Ngoc, 2018; Tin et al., 2019, Tin et al., 2019), changes to locals' livelihood (P. Brown, 2011) including tourism/eco-tourism activities (Nguyen, 2019; Trinh, 2013) and community-based management with outstanding practices (The East Asian Seas Congress, 2009; Trinh & Brown, 2008). While Huyen, Chien, An and Ha (2010) provide an economic valuation of the CLC, they only concentrate on the coral reef ecosystem's value and do not consider the other economic values of the MPA from visitors. It is considered an essential part of the integrated management of the MPA. This study empirically investigates the perceived values of the MPA (such as recreation and conservation values) with regards to the economic components to ensure the sustainable development of the MPA.

Specifically, this study estimates the economic benefit of marine resources (including the functions and services of marine resources) in the CLC MPA. This study provides more information which will support integrated coastal management (at both a local and provincial level) and sustainable development. It will also enhance policy makers and managers in policy decision-making related to the management of the CLC MPA. This study also includes a benefit analysis of the CLC MPA's entrance fees. These estimates are measured and expressed in monetary terms.

The research objectives are

1. To estimate the recreational benefits derived from the CLC MPA. We also determine the factors that affect the visitors' recreation demand in the CLC MPA.
2. To investigate the effect of multi-site trip in trip demand models on the visitors' consumer surplus (CS).
3. To estimate visitors' willingness to pay (WTP) for the conservation of the CLC MPA.

4. To analyse the effectiveness of MPA entrance fees to support the integrated coastal management and the sustainable development of the CLC MPA.
5. To provide policy makers with up-to-date information about the impact of increased numbers of visitors to the CLC MPA.

1.4.2 Research Questions

The study answers five research questions. They are:

1. How do factors such as travel costs and individual socio-economic characteristics (such as income, education, and age) affect the recreational demand for the CLC MPA? How much is the annual recreation value of the CLC MPA?
2. Are there changes in the visitors' CS and aggregated benefits from the CLC MPA recreation values if multi-destination trips are included in the demand model?
3. What are visitors' WTP for the conservation of the CLC MPA? What factors affect their WTP?
4. Is the current entrance fee adequate to finance the MPA management and conservation programme?
5. How should the MPA Management Board and provincial authorities deal with in an increased number of visitors visiting the CLC MPA?

1.5 Thesis Organisation

This thesis is composed of seven chapters. Chapter One introduces the study and research area. It presents the background of the study and problem statement. Chapter Two reviews economic valuations for marine and coastal resources, focussing on sustainable development for coastal areas. A review of research methodologies and previous studies on the economic valuation of natural resources and environment will also be briefly addressed. Chapter Three describes and explains the theoretical framework and empirical models used in this study.

Chapter Four presents the descriptive statistical results for the surveyed respondents. The chapter also describes and explains the data collection method and the survey questionnaire design. Chapter Five reports the results of the Travel Cost model and empirical analysis for recreational demand as well as calculations for the consumer surplus. Chapter Six presents the WTP for CLC MPA conservation and factors that affect the respondents' WTP. Chapter Seven discusses the implications of the findings from both a theoretical and a methodological perspective. It also specifies the limitations of the study and identifies opportunities for future research.

Chapter 2

Literature Review

2.1 Introduction

The world's marine environment and resources are being negative impacted from human activities and climate change. Bijlsma (1997), and Moreno and Amelung (2009) indicate that climate change and the rise in sea level associated with continuing urbanisation gave rise to a range of issues, including overexploitation of resources, pollution, the degradation and loss of ecosystems, and beach erosion. Sustainable development is understood as a solution to maintain these resources (Ledoux & Turner, 2002).

The establishment of MPAs is expected to contribute to the sustainable development of marine environments and resources. They would be culturally-socially, economically and environmentally used. MPAs are not only designed for conservation but also to support eco-tourism and recreation activities, such as swimming, snorkelling and diving. However, these activities may conflict with the MPA's conservation objective; what is needed is a total cost-benefit analysis of MPAs. Economic valuations of MPAs provide a comprehensive solution for MPA management in the context of economics and marine resources management.

This chapter is structured as follows: Section 2.2 discusses the relationship between marine resources, sustainable development, and climate change. Section 2.3 explains the concepts and methods used to estimate the total economic value of marine goods and services. Section 2.4 interrogates literature on the economic valuation of marine resources and the environment. It provides information about methods commonly used to estimate the value of these resources (travel cost and contingent valuation) and concerns about charging users a fee to enter MPAs.

2.2 The Marine Environment and Resources: Sustainable Development and Climate Change

The marine environment (oceans, seas, and adjacent coastal areas) plays an important role in human lives (UN, 1992). Countries with or without shorelines are linked to the ocean through systems of rivers, open lakes and streams. Marine resources play an essential role in coastal and island economies. In 2014, benefits from marine goods and services contributed over 60% of the global gross national product – a large proportion of each economy (Cicin-Sain, 2014)

However, overexploitation has had a severe impact on marine resources and the coastal environment. Marine resources have become scarce, which generate costs and benefits for human welfare. The mass quantity of residuals and waste from the production, tourism and human activities discharged into the coastal environment has affected the quality of coastal ecosystems and marine environments, both in the short- and long-term. The future of marine fish catchments will worsen if countries fail to manage coastal zones (Turner et al., 1998).

Pressure from the development of coastal areas and marine resource exploitation require new approaches towards sustainable development and sustainable exploitation. These new approaches should be integrated in content, equal and efficient in policy, and precautionary and anticipatory in ambit (Ahlhorn, 2009; Cicin-Sain, 1993; Finkl & Makowski, 2015; Salomons, Turner, Drude de Lacerda, & Ramachandran, 1999; Turner et al., 1998; UN, 1992) of coastal management at all global levels (globe, region, sub-region and nation). In Agenda 21, The United Nations decreed that sustainable development for the marine environment should be driven and controlled by the International Law of the Sea of the United Nations Convention (UNCLOS). This law outlines the rights and obligations of all states. It also provides an international platform to ensure the protection and sustainable development of marine and coastal environments and their resources (UN, 1992).

Due to significant concerns of coastal management in the last few decades, many coastal countries and territories have opted for sustainable development. Sustainable development was officially adopted by Brundtland et al. (1987) in the Report of the World Commission on Environment and Development "Our Common Future". According to the Brundtland Commission "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (p. 41). However, since then there has been ongoing debate about the meaning and nature of sustainable development. Scholars working in this area have a tendency to focus on approaches, which combine economic development, social sustainability, and ecosystem protection rather than trans-generational issues. For instance, some scholars argue that human activities oriented toward sustainable development should be economically, socially and culturally desirable, and simultaneously environmentally sustainable (Sachs, 2015; Söderqvist, Eggert, Olsson, & Soutukorva, 2005).

Sustainable development involves three pillars: (1) *Economic development* which improves the welfare of human beings; (2) *Environmentally appropriate development* in which natural capital is used wisely and is environmentally oriented. In other words, any development must ensure the conservation of the ecosystems and biodiversity of our planet. In short, economic development must not harm the wildlife nor pollute or change the environment. (3) *Social development* is to fairly allocate natural capital among groups, and communities (especially indigenous people and vulnerable groups) in each nation, across nations, and across generations (Cicin-Sain, 1993). Sustainability, therefore, emphasises development that ensures equality, efficiency and precaution in using natural resources to create welfare for current generations, especially the resources accessible to the poorest groups, without generating any significant cost for future generations (Turner et al., 1998).

Sustainable development has been discussed from many different points of view, including biodiversity, cultural conservation, poverty reduction or social development, and equity. From an economic perspective, Ledoux and Turner (2002), and Turner (1993) discuss two concepts: weak and strong sustainability. *Weak sustainability* requires that man-made and natural stocks of capital are maintained and perfectly substitutable. If natural capital is decreased, then man-made capital must be increased to offset the decline of the natural capital and vice versa (Mercado, 2001; Ledoux & Turner, 2002). This implies that the scarcer natural resource stocks are, the higher their price, which stimulates the efficient use of resources and discovery of other alternatives (good substitutes or advantageous technologies). The drawback of this approach is that man-made capital cannot compensate for the loss of natural capital such as the loss of biodiversity or the extinction of wildlife (Ledoux & Turner, 2002). In contrast, *strong sustainability* requires that there is no decrease in the total natural capital. Thus, development employs natural capital and human-made capital for its purposes while maintaining both stocks or without reducing their quantity and quality. The theory of strong sustainability is designed to prevent natural capital from declining. Any natural capital losses should be avoided or compensated for (Ledoux & Turner, 2002; Turner, 1993).

Pursuing strong sustainability is sometimes complicated. For example, one area of abundant natural capital is marine and fish products. This natural capital has been overexploited and was depleted in the late 20th and early 21st centuries as a result of increased worldwide demand and a rise in human consumption (Aronson, Milton, & Blignaut, 2007; Turner et al., 1998). These marine stocks cannot be maintained in the short term because of a lack of integrated coastal management solutions within coastal nations and trains-nations. In this instance, the conditions for strong sustainability (natural capital stocks will not decrease) has not been met at a global scale (Turner et al., 1998).

To achieve this goal, coastal sustainable management should focus on the sustainable use of goods and services (Ledoux & Turner, 2002). Sustainable use can be accomplished via sustainable fish catches, recoverable energy manufacturing, ecotourism and "green" shipping (Cicin-Sain, 2014). Sustainability can be improved through adopting further precautionary measures (Turner et al., 1998).

Marine environment management not only includes integrated management and sustainable development, but also takes into account the impact of climate change. In the last few decades, coastal areas have experienced an increased frequency and intensity of climate extremes, including stronger hurricanes, typhoons, cyclones and severe weather conditions. Abnormalities in the oceans and seas can be seen in increased acidification, a global rise in sea levels and fluctuations in ocean circulation and salinity. These changes have also affected coastlines and inland regions through ocean currents or weather systems. By 2050, an estimated of 50 to 200 million people worldwide will be affected by the adverse impacts of climate change, food security crises and other social issues. A combination of mitigation and adaptation measures for climate change should be designed to enable emergency support and a quick response to natural disasters. These measures include early warning systems, observation systems and coastal management systems (Cicin-Sain, 2014).

Over the last three decades, since the establishment of the Intergovernmental Panel on Climate Change (IPCC) in 1988, climate change has been increasing as a global environmental problem. It influences sustainable development by generating threats to economic, environmental and social systems. These unpredictable and unprecedented events may include a loss of production because of abnormal floods, strong hurricanes or landslides, the loss of social welfare due to a loss of resources or properties, and environmental devastation and natural resource degradation. The emission and accumulation of anthropogenic sourced greenhouse gases in the global atmosphere, (e.g., from the burning of fossil fuel), has sharply increased. Climate change influences the balance of our global subsystem (Munasinghe, 2007). Since the industrial revolution, developed countries have contributed most to the sources of greenhouse gases. This is changing however, with increased emissions from undeveloped and developing countries trying to narrow the economic gap with developed countries. The United Nations' Framework Convention on Climate Change (UNFCCC), governments, parties and independent scientists have all reiterated the need for collaboration at the global level to ensure sustainable development objectives and climate change issues can be tackled (Markandya & Halsnaes, 2002).

The 20th century was a significant period in terms of global warming and rising sea-levels. These natural phenomena have contributed to increased coastal flooding, coastal erosion, estuary transformation, and the disappearance of some ecosystems. Coastal areas are highly vulnerable to extreme weather events such as severe storms or sea-level rises. In coastal societies, these events create substantial economic damage and often result in the loss of human life. Nicholls et al. (2007) estimate that of the 120 million individuals affected by tropical hurricanes between 1980 and 2000, there were approximately 250,000 people who died per year. This means that nearly 2% of the global population lost property or even their lives to natural disasters (some of which originated from human activities). The rise in global temperature in late 20th century has affected oceans and seas through shrinking the sea ice, melting permafrost and more frequent bleaching and mortality of marine creatures, especially coral reefs in tropical oceans. Scientists have also observed more unpredictability in ocean stream circulation, changes in the frequency and category of hurricanes and abnormal ocean wave regimes (Remoundou, Diaz-Simal, Koundouri, & Rulleau, 2015).

Climate change affects marine creatures by altering the supply and distribution of nutrients. It also leads to physical and biological changes in their habitats (e.g., increased ocean acidification or the presence of non-indigenous species) (Turner, 2000). Their reproduction, as well as productivity, are affected because of increased temperatures and abnormal events in microclimate and weather conditions. Changes also occur in the relationships between predator and prey, which can make marine and coastal ecosystems more vulnerable, especially in high biodiversity areas like estuaries (Remoundou et al., 2015).

The consequences of climate change and global warming, sea level rises and changes in wave regimes impact natural landscapes and social activities in coastal areas. This results in significant erosion of beaches and the transformation of river mouths. These phenomena also have an adverse effect on coastal recreation and the marine tourism industry (Remoundou et al., 2015). Coastal tourism and climate change are interrelated; coastal tourism also affects the natural environment. According to Lenzen et al., (2018), global tourism, of which coastal tourism is a key sector, contributes 8% of the total global greenhouse gas emission. The emission sources are mainly from transport and energy use for tourism activities/facilities. Climate change and global warming affects the coastal and marine tourism industry in several ways. These include: (1) a deterioration of coastal and marine values, which are available for tourism; and (2) changes to or increased extreme weather conditions that affect visitors' access to coastal and marine recreation. While the relationship between coastal tourism and climate change is sometimes observable (swimming and sunbathing is directly related to the weather), at other times this relationship is unobservable, such as decreased populations of marine species, because rising ocean temperatures lead to a decline in visits by travellers (Moreno & Amelung, 2009).

As a major characteristic of many marine recreation areas, coral reefs contribute to the beauty and attraction of the coastal and marine environment. However, in 2005, 10% to 30% of all coral reefs worldwide were degraded or unrecoverable because of global warming (Asafu-Adjaye & Tapsuwan, 2008). The world coral reefs would be extinct if global temperature in association with acidification increased by two degree Celsius (Leal Filho, Barbir, & Preziosi, 2018). The loss of coral reefs leads to a decreased number of coastal eco-tourists whose under-water activities mostly include snorkeling, scuba-diving or fishing from coral reefs (Asafu-Adjaye & Tapsuwan, 2008). This loss may also affect the visitors' WTP for conservation in many coastal areas or the MPAs they visit.

Coastal management and sustainable development must not only resolve the pressure and impact of human activities, but also take into account the significant risk of natural disasters, global climate change and rising sea-levels (Bijl, 1997; Bijlsma, 1997; Bird, 1993; Crooks & Turner, 1999; Holligan & Reiners, 1992; IPCC, 1996). As MPAs were introduced as a management tool for marine resource and biodiversity conservation worldwide, cost-benefit analysis of MPAs should be factored into most economic valuations. Some general observations about MPAs in the context of sustainable development from recent studies have identified two specific issues. First, the establishment of an MPA may boost human well-being at a social level if it makes individuals or groups better-off without making others worse-off. Secondly, an MPA could potentially improve a community's social well-being if the benefits from indirect use values compensate for losses associated with direct use values. As marine resources are public assets, it is difficult to ensure they are used efficiently or used for a single purpose. It is thus crucial to address both social and economic welfare in any sustainable development (Carter, 2003).

Apart from conserving biodiversity, the establishment of an MPA is suitable for recreational areas with coral reefs, fish, beaches, biodiverse vegetation and peaceful island settings. These features boosts the development of eco-tourism, especially in developing countries. Conflicts, however, may arise as a result of tensions between the conservation goals and eco-tourism. An MPA may attract more visitors and generate greater benefits for tourism and sometimes local residents. However, more visitors may overload an MPA's capacity and ultimately cause harm to the marine species that these establishments are designed to protect. Increased visitors may also create other environmental problems for coastal communities, such as water and air pollution, or the over-use of natural resources (Yacob, Radam, & Shuib, 2009). Integration of the MPA management is necessary to reduce conflicts within the MPA and reduce the adverse impacts of coastal development on conservation (Söderqvist et al., 2005).

2.3 Total Economic Value – Concepts and Methods

2.3.1 The Fundamentals of Total Economic Value

Valuing environmental and natural resources is not always a straightforward process. It requires different methods and techniques to help environmental economists estimate all the attributes of environmental goods and services. One popular approach is the Total Economic Value (TEV) approach. The TEV of environmental goods and services includes the expected benefits from their use values and their non-use values. The TEV is the total value that the environment contributes to human society through its flow of goods and services. It is the sum of all values of environmental goods and services attributes. In other words, it consists of the economic values derived from goods and services that environmental systems and their functions provide to society (Goodman, Seabrooke, & Jaffry, 1998; Knights et al., 2013).

Environmental goods and services are divided into various components. Some parts may be reflected in the market price system, whereas others are not marketed-commodities (such as the assimilation function of the ocean in absorbing wastewater from inland sewage discharges or the creation of valuable habitats from mangrove forests for aquatic species). The value of goods and services that are priced in the market can be easily estimated: for example, a kilo of fish or a cubic metre of natural gas. The value of non-marketed goods and services however, is only partly captured or is difficult to estimate. Splitting environmental goods and services into single components is considered acceptable for evaluating their unique value. The TEV combines all single values from each element into a total amount (Dixon & Pagiola, 1998).

The TEV of natural resources is not only used for economic purposes but also for policy appraisal and decision-making: for example, public investments related to environmental protection and quality improvement or ecosystem and biodiversity conservation and preservation (Goodman et al., 1998). A TEV helps decision making related to any economic development project. The cost-benefit analysis approach uses TEV to estimate the costs and benefits of changes caused by economic development and proposes alternative development(s) (Knights et al., 2013). In addition, TEV encourages environmental goods and services to be taken into account for social development, sustainable use, research and policy making, and for conservation endeavours (Admiraal et al., 2013).

To obtain an estimate of environmental assets/natural resources Ahmed et al. (2005), Bateman et al. (2002), King (1995), and Spurgeon (1992) attempted to quantify both use values and non-use values from coastal and marine resources, functions and services. The net benefits derived from use and non-use values are benefits provided by coastal and marine ecosystems (Samonte-Tan et al., 2007).

Following Costanza et al. (1997), Spurgeon (1992), and Turner (2000), the TEV estimate consists of:

$$TEV = UV + NUV \qquad = (DV+IDV+OV) + (BV+EV) \qquad (2.1)$$

$$\text{Or} \qquad = (DV+IDV) + (OV+BV+EV) \qquad (2.1a)$$

Where: UV = Use value; NUV = Non-use value; DV = Direct value; IDV = Indirect value; BV = Bequest value; OV = Option value; and EV = Existence value.

Direct use values are consumptive or extractive use values (such as net returns for fishing, construction material for exploitation or fuel extraction), and non-consumptive or non-extractive use values (e.g., tourism, aesthetic or other recreational use that people can enjoy) (Mitrică, Mitrică, & Stănculescu, 2013; Samonte-Tan et al., 2007). In the coastal area and marine resources (e.g., a coral reef), consumptive or extractive use values include fishing, oil extraction, marine navigation and exploiting of seagrasses/shells. The non-consumptive use values include scuba diving and underwater excursions (Dixon & Pagiola, 1998).

Indirect use values are the functional values provided by environmental goods and services, such as wetland provisioning services, that mitigate the impact of ocean hurricanes on coastal areas and communities, protect coastlines and coastal communities from salt intrusion, and reserve habitat for aquatic species (Dixon & Pagiola, 1998; Mitrică et al., 2013; Samonte-Tan et al., 2007). The indirect use values consist of support services for environmental resources, such as the assimilation of natural waterways to clean up polluted water/wastewater before discharging it into natural flows. However, this assimilation function of environmental resources has a threshold capacity; it can only assimilate a certain volume of wastewater under specific quality conditions. Otherwise, wastewater will not be cleaned. A valuation of those functions is difficult to obtain because they do not enter the market and, consequently, have no price in the market. For instance, it is hard to establish a direct price for the enjoyment of a recreation area provided by the landscape because there is no market for this commodity to price the benefits enjoyed by the consumers (Dixon & Pagiola, 1998). Valuation requires hypothetical markets or relies on markets of similar goods and services to estimate the value.

Non-use values (NUV) comprise option values (OV), bequest values (BV) and existence values (EV). *Option values* reflect alternative values of natural resources and environmental goods and services that we want to preserve for future benefit or to maintain for later use. Some researchers refer to option values as potential use values whilst others refer to them as potential non-use values. *Bequest values* are values that the current generation passes or leaves from natural assets to future generations. *Existence values* imply values that individuals find in knowing that particular natural resources and environmental goods and services exist even if they have not received any benefits from their existence or do not plan to use them (Dixon & Pagiola, 1998; Goodman et al., 1998; Knights et al., 2013; Mitrică et al., 2013; Samonte-Tan et al., 2007). For example, the presence of blue whales or pandas is an existence value (Dixon & Pagiola, 1998). People place value on the existence of these species even though they have never seen or used them and probably never will. This value is accompanied by people's feelings towards the existence of these species with the aim of biodiversity conservation. Their satisfaction is derived from the presence of those species; many people would experience a feeling of loss if the blue whale or panda became extinct.

The economic value of coastal and marine resources is derived from their outputs (e.g., catching fish, renewable energy production, recreation, biodiversity or aquaculture), and their services (e.g., habitats and shelter for fish and shellfish from coral reefs, contamination retention/dispersion, sewage/solid waste disposal, bathing water, international trade medium (navigation)) (Turner, 2000). These values must be estimated in monetary terms. However, there are actual market prices only for some goods and services. Some market prices are expressed through lost benefits from using environmental goods and services: for example, loss of earnings from reduced mariculture production because of global warming or water pollution (Crooks & Turner, 1999). Some other goods and services are non-market commodities (there is no market where they are tradable in terms of money) and thus, they remain unpriced. For example, habitats for aquatic species provided by ecosystems do not exist in the market and no market price can be applied to this kind of service.

Valuation techniques have been introduced to value non-market goods and services (see section 2.3.2) including surrogate market benefit valuation and hypothetical valuation. Surrogate market valuation uses consumers' behaviour preferences to reveal their consumption of market goods and services to estimate values of non-market goods and services. For instance, visitors' total travel costs (including travelling expenses, tickets for entrance fees and related charges and accommodation) to visit a MPA is used as a proxy for the value of the recreational area they visit. In contrast, hypothetical valuation or survey-oriented valuation, is a technique in which proposed hypothetical markets are established in a questionnaire-based survey that aims to elicit respondents' WTP for or willingness to accept (WTA) proposed hypothetical market goods or ecosystem services: for example, an individual's willingness to choose between two proposed scenarios of environmental management, with management and without management (Ahmed et al., 2005; Crooks & Turner, 1999).

The establishment and improvement of the TEV concept are beneficial not only for estimating the values of environmental goods and services but also values associated environmental goods and services: for example, the value provided by MPAs (Babier, Acreman, & Knowler, 1997; Pearce & Turner, 1990). The MPAs' use values combine extractive and non-extractive resources (direct use values); biological, physical or global support (indirect use value); and non-use values (e.g., for future generations' use or conservation and maintaining biodiversity) (see Figure 2.1).

While some MPA non-use values have not been explored, it is likely they will be in the future. For example, individuals may be willing to pay to use the environment but as an option in the future (optional value), or display a WTP to preserve the environment for future generations (bequest value) (ADB, 2002; Freeman, 1993; Munasinghe & Lutz, 1993; Turner, 1993).

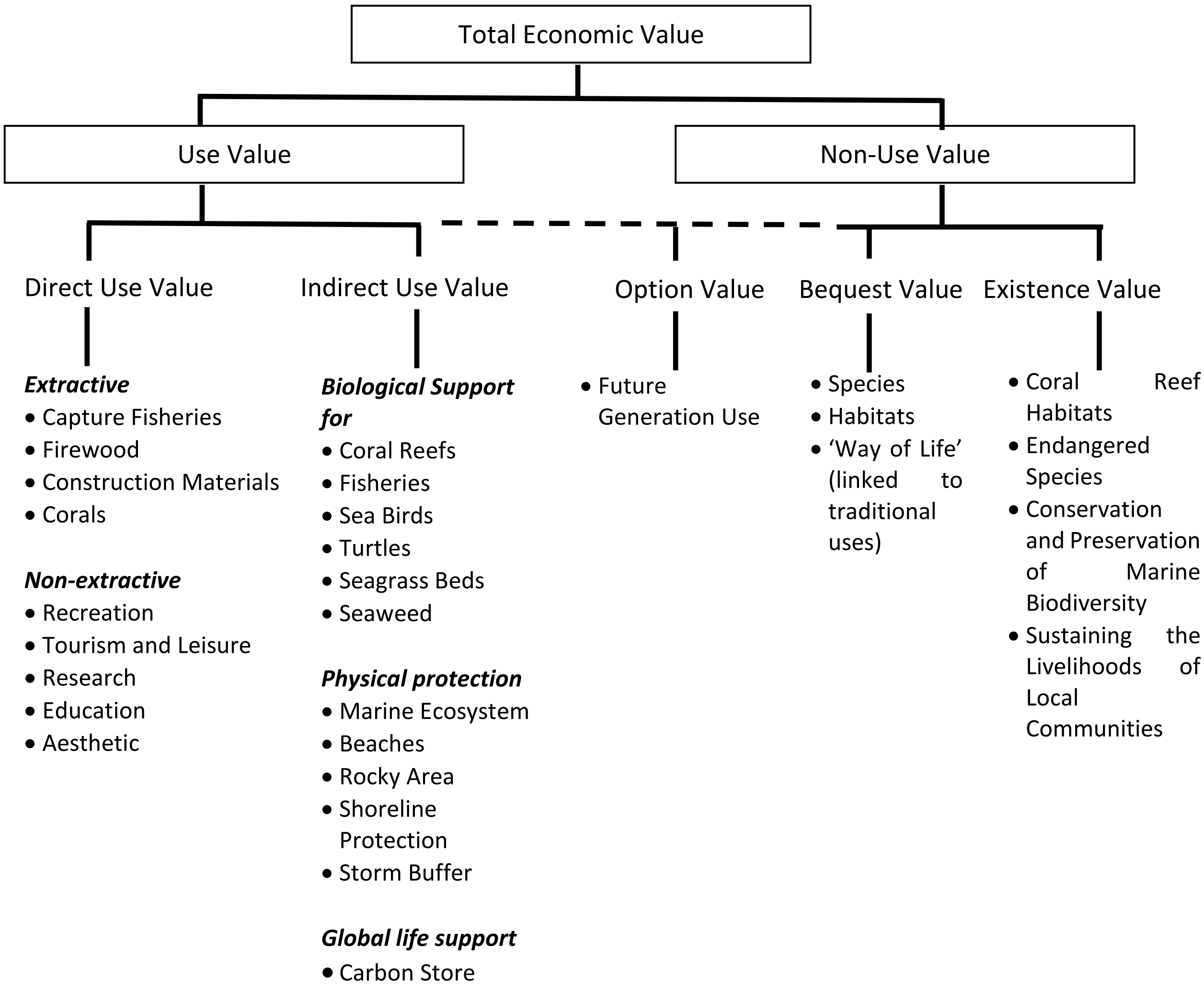

Figure 2.1 Marine products, functions and services in MPAs

Source: Adapted from Cesar (2000), Emerton (1999), Munasinghe and Lutz (1993), and Spurgeon (1992)

2.3.2 Economic Valuation Methods and Techniques

For ecosystem goods and services like timber, which is tradable in the market, economic value is estimated based on the cost to bring them to the market. This valuation is reasonably simple because existing trades in the market are used to estimate the value (Farber, Costanza, & Wilson, 2002). However, many ecosystem goods and services and their elements are unpriced in the market or they are non-marketed commodities, such as the flood control services of a wetland. This situation requires indirect or substitute economic methods to estimate the correct value in monetary terms (Farber et al., 2002; Knights et al., 2013). These economic methods include WTP and WTA, concepts which are used to estimate non-marketed goods and services. WTP for goods and services expresses the amount society is willing to pay for using goods and services. WTA refers to the amount that society would be compensated for the loss of goods and services (or to maintain the status quo of the goods and services from destruction) (Farber et al., 2002). The economic methods used to value both marketed and non-marketed goods and services are recognised as stated preference and revealed preference methods (see Figure 2.2). The use of a suitable technique from these methods depends on the nature of value and the availability of data (Fujiwara & Campbell, 2011; Garrod & Willis, 1999; Nunes & van den Bergh, 2001). The valuation methods not only capture single values but also the combined values of ecosystems (Beaumont, Austen, Mangi, & Townsend, 2008).

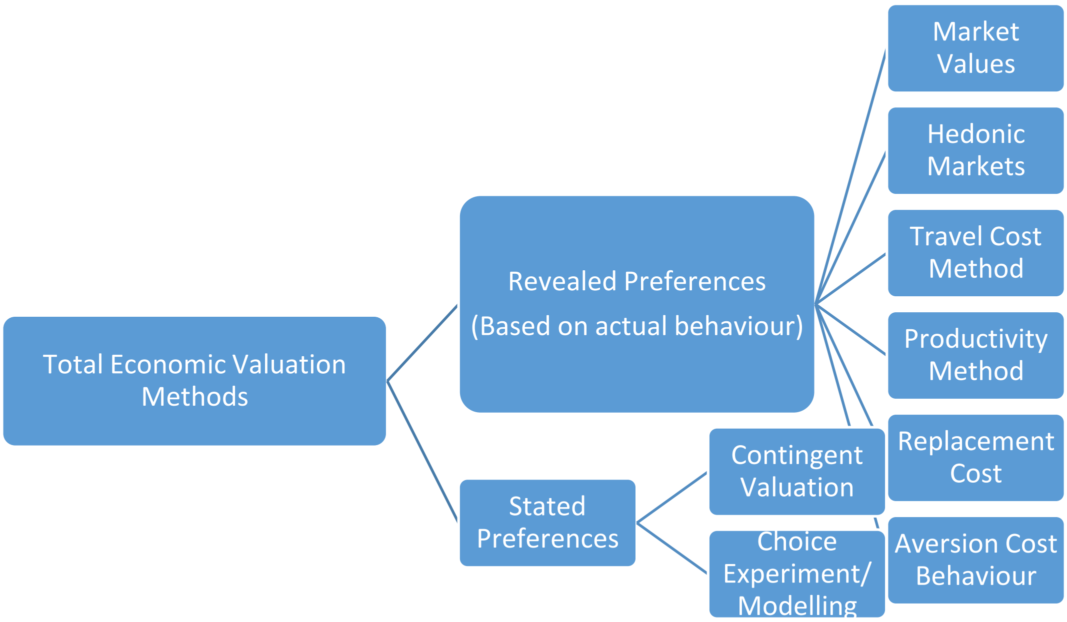

Figure 2.2 Methods for total economic valuation (TEV)

Source: Adapted from Cesar (2000), Garrod and Willis (1999), Ledoux and Turner (2002), and Turner, Pearce, and Bateman (1994)

There are various techniques used to value each component of environmental goods and services. Although one technique can estimate several components of environmental values, each environmental component can be valued by more than one appropriate technique (Table 2.1) (Dixon & Pagiola, 1998).

Table 2.1: Different valuation techniques relating to environmental goods and services

	Direct use value	Indirect use value	Option value	Bequest value	Existence value
Market Price (Market Value)	V	V			
Hedonic Price	V	V	V		
Travel Cost Method	V	V			
Effect on Production	V	V			
Replacement/Restoration Cost	V	V	V	V	V
Contingent Valuation	V	V	V	V	V
Choice Experiment	V	V	V	V	V

Source: Adapted from Dixon and Pagiola (1998), Ledoux and Turner (2002)

Revealed Preference Methods are based on models of actual market behaviour for non-market goods and services. For example, the *Travel Cost Method* and *Hedonic Price* models use observations of actual choice and observations of factors affecting choice (price, environmental quality attributes or individual specific attributes) to develop models of demand for non-marketed environmental goods or services (Willis & Corkindale, 1995).

The *Travel Cost Method (TCM)* is used to estimate the cost that each individual pays for travel to visit one place (e.g., a recreational area), and the cost of travel time. The distance between the visitor's departure point and destination will be proportional to the total cost of the visit (Ahmed et al., 2005; Dixon & Pagiola, 1998; Voke, Fairley, Willis, & Masters, 2013). The total cost for each visitor is used to construct the "demand curve" for the recreational area. The demand curve shows the total visitor benefit or CS from using the recreational area (Ahmed et al., 2005; Dixon & Pagiola, 1998).

The *Hedonic Price Method* reveals the WTP of people who use non-marketed environmental goods (or services). It is interpreted through their choice of actual market goods (or services) that are assumed to be affected by non-marketed goods and services. For example, similar quality houses in the same area may be sold at different prices as a consequence of the presence or non-presence of the surrounding landscape. Properties in a good natural environment, one that has low air pollution, may have a higher price than those in an area with high pollution (Dixon & Pagiola, 1998; Knights et al., 2013). This technique can be applied to various areas, from property values to wage data analysis. In order to provide a robust valuation, scholars using this method need a large number of observations and available data on goods and services' prices and characteristics (Dixon & Pagiola, 1998).

The *Market Value (Market Price)* means there are available prices for environmental assets in the market (Ledoux & Turner, 2002) or where environmental goods and services are traded (Emerton, 1999). These prices reflect what people are willing to pay for them and the value they place on them (Emerton, 1999).

The *Productivity Approach* or Effect on Production (EoP) aims to estimate the producer surplus generated by the direct use value of environmental goods or services. It estimates the difference in the value of the productive output before and after the change in the goods and/or services: e.g., the change in a marine protected area with different management scenarios (Cesar, 2000). The most popular technique to estimate the EoP involves using the net present value calculation of environmental goods and/or services over time (Ahmed et al., 2005).

Replacement Costs represents the costs of synthetic stocks or technologies, which are used to replace the lost value of environmental services or functions. In short, the replacement cost is the estimated partial cost of restoring or replacing environmental assets. For example, the expenditure associated with re-planting plants in a wetland is considered a replacement cost for the loss of the wetland if it occurs (Dixon & Pagiola, 1998; Emerton, 1999). The replacement cost method is usually applied to estimate the cost of pollution, such as the restoration cost for infrastructure damage from acid precipitation (Dixon & Pagiola, 1998).

Stated Preference Methods, rely on hypothetical market behaviour (Bateman et al., 2002) or have their roots in conjoint analysis with the particular type of experimental analysis of choice (Batsell & Louviere, 1991). Stated preference methods include:

Contingent Valuation Method (CVM) describes non-marketed goods and respondents' services via a constructed or hypothetical market. The respondents' stated preferences reveal their WTP or WTA (for compensation) for those commodities. This technique commonly uses a survey to gather various information and a proposed market for environmental commodities. The survey is usually based on WTP (or WTA) questions. Respondents are asked to indicate the maximum or minimum amount of money they would be willing to pay for their use or to increase or decrease the quality of environmental goods and services (Ahmed et al., 2005; Belt & Cole, 2014; Carson, 2012; Day & Maurato, 2002; Louviere, 1994).

Choice Experiment or *Choice Modelling* evaluates respondents' preferences about changes in environmental attributes with different strategies or different scenarios. Environmental goods and services are considered as a series of attributes on different levels. The choice that each individual makes regarding each attribute of the environmental asset is priced and estimated in monetary terms (Garrod & Willis, 1999).

2.4 The Economic Valuation of Marine and Coastal Resources

2.4.1 General Issues

In many developing and undeveloped countries, marine resources[1] in coastal communities are severely undervalued because their economic values are not entirely recognised and estimated. This has started to change with more interest from economists, central and local governments and local people whose benefits are affected by marine resource over-exploitation. If their values can be estimated, marine resources can sustainably contribute to global economic welfare. If not, they will continue to be undervalued, resulting a lack of interest in conservation and a decrease in received benefits. Economic valuation provides a useful tool for capturing sustainable development by specifying the importance

[1] For simplicity, this includes coastal resources along with marine resources

of marine ecosystems to the economy in monetary terms. It also shows what a society may lose if marine ecosystems are not protected and preserved (Lange & Jiddawi, 2009). In addition, economic valuation provides vital information for policy planners so that they can factor in the matter of sustainability in a market-based economy (Ledoux & Turner, 2002).

An economic approach is required to measure and analyse the value of marine goods and services. The aim of such a valuation is to capture their value for the purpose of sustainable development, policy proposals and knowledge contribution (Dixon & Pagiola, 1998; Söderqvist et al., 2005). The economic valuation of natural resources is an increasingly popular approach to assess how economic goals affect sustainable development (Söderqvist et al., 2005). Such valuations can also be used to help offset negative impacts on the environment and society from economic activity (Dixon & Pagiola, 1998).

Marine goods and services generate welfare values from which human beings benefit from their development. These values should be estimated using an economic approach. However, some goods and services are not valued in the market, e.g., wetland ecosystems and marine recreation areas, because there is no market for these commodities (Dixon & Pagiola, 1998; Söderqvist et al., 2005). Specifically, many marine resources and functions are not tradable so there is no market price system to capture their value. For instance, there is no tradable market where one can buy or sell the services of flood control from wetlands even if these services benefit society by reducing losses from flooding (Farber et al., 2002). In some cases, environmental goods and services are considered 'free' because there is no system of monetary valuation. For example, when valuing marine ecosystem functions, nutrient cycling lacks any real attention from society and is overlooked because it does not directly affect human welfare. However, nutrient cycling affects ecosystem production, and damage to this may harm food chains in the ecosystem and cause a decline in ecosystem values (Beaumont et al., 2008).

Although the economic valuation of marine resources is a state-of-art approach to sustainable development, the valuation is still based on economic fundamentals. It conserves the environment and natural assets within a tolerable threshold in the context of sustainable development. For example, the core issues of market failure and pricing in economic development should be included in the economic valuation under the framework of natural resources and environmental preservation (Turner, 1993). Ocean and marine resources are global, open-access goods and services and are generally unpriced or under-priced (King, 1995; Söderqvist et al., 2005; Turner, 1993) due to a lack of property rights and the presence of environmental externalities such as environmental pollution (Panayotou, 1994). Unvalued environmental goods and services result in over-production (exploitation) of those goods and services, which are depleted and/or degraded in development that is unsustainable (Beaumont et al., 2007; Panayotou, 1994). Human beings will face many difficulties in the future (e.g., food crises from fishing) if current marine resource exploitation practices and trends are not improved (Ledoux & Turner, 2002). We require a strategy that ensures an efficient intertemporal allocation of ocean/marine resources through a price correction mechanism based on individual preference/state value (Turner, 1993) or an entrance fee system at MPA (if available) (Walpole, Goodwin, & Ward, 2001; Willis, 2003).

Another concern about economic valuation relates to the need to ensure the sustainable, efficient use of marine resources for human development, without depleting them. To resolve this issue, scholars employ a cost-benefit analysis of resource use to assess which development alternative is acceptable. Hence, an estimation of costs and benefits from resource use should be included in any economic valuation. The valuation also needs to quantify other costs such as the opportunity cost or the environmental protection cost society must pay to improve sustainability standards. The opportunity cost of using resources is useful in decision-making as it allows individuals to compare the costs of present and forthcoming measures to protect the environment and natural resources (Ledoux & Turner, 2002). It includes the loss of potential development opportunities and/or the exploitation of natural resources to implement priority targets (Dixon & Pagiola, 1998). For example, a valuation may include the value of conservation against the value of pharmaceutical bioprospecting that produces pharmaceutical products in prohibited MPAs. The bioprospecting value may not be considered and the revenue from its value may be omitted. This omitted revenue (or loss) can be considered a potential opportunity cost (Carter, 2003). Opportunity costs related to MPA establishment may include the lost income of people who exploit marine resources for their livelihood and the expenditure which is lost as a result of changing/adjusting their livelihood activities because of the establishment of the MPA (Emerton, 1999).

The economic valuation of marine resources also needs to take into account conflicts between interested parties or shareholders. For instance, it needs to consider the needs of local communities who are interested in developing coastal areas and other groups in urban areas, who want to maintain coastal areas for recreational or aesthetic values. As people who live in urban areas experience increased incomes, they may be willing to pay more to maintain the quality of coastal nature not available in their urban areas. Another conflict may occur between those who rely on coastal resource exploitation (e.g., fishermen) and those who use coastal ecosystems to discharge their waste or emission (e.g., wastewater, nutrients or municipal waste). These emissions contribute to eutrophication, which pollutes the marine environment and affects fish stocks in the catchment's waters. Fishermen's livelihoods may be affected. They have to share their demand for coastal resources with emitters who use coastal areas as a sink for emission discharge (Söderqvist et al., 2005).

Valuing or pricing ocean and coastal resources is essential for sustainable development in coastal countries. It helps decision makers appraise and enhance the quality of policies to balance the costs and benefits and multiple uses and goals derived from coastal resources (Ledoux & Turner, 2002; Sumaila & Charles, 2002). Valuing determines how much marine and coastal resources can contribute to coastal economies and helps improve marine conservation programmes (Lange & Jiddawi, 2009). Coastal countries have paid much attention to the sustainable management of coastal systems and marine resources using various valuing and pricing systems. For instance, Akhter and Yew (2013) list 17 studies in Southeast Asian countries, which address the management of MPAs' and provide economic valuations. These studies show how important it is to establish pricing systems for MPAs (such as entrance fees), to help fill financial deficits related to their management. It also helps maintain conservation programmes in MPAs. Ledoux & Turner (2002) reviewed 59 studies on the valuation of coastal and environmental resources. The authors concluded that sustainable development is necessary to value ocean and coastal goods and services and have insight into decision making.

Assessment of marine resource evaluation has received more attention since the 1970s (Beaumont et al., 2008). Whitehead (1993) estimated the TEV of wildlife resources in coastal North Carolina. In the UK, Goodman et al. (1998) measured the non–use value of natural coastal environment quality: their work was used in policy making to assess policies' effectiveness in the management of natural resource use. The study took into account the UK government agencies' attempts to consider the TEV of natural resources in their appraisal of policy alternatives. King (1995) estimated users' recreational values derived from the beach at Eastbourne, England, during the peak tourist season. King explained the concept of economic value and recommended valuation methods for environmental management appraisal in England, particularly for the marine environment. Although these studies focussed on different locations, both concentrated on the economic value of marine wildlife and coastal resources and monetised these resources using a range of techniques. These assessments are useful for policy appraisals and/or improved public decision-making for the use of coastal resources.

The economic valuation of an MPA includes two factors: the benefit of the MPA and the cost associated with the degradation and loss of resources in the MPA. The MPA benefit comes from the extraction of raw materials, using nature-based recreation, and supporting and protecting systems for humans and nature (e.g., how mangrove forests protect coastal communities' lives and infrastructure from ocean waves and salt intrusion). In contrast, the cost of the MPA is related to the impact of human activities like pollution (such as oil spills into sea water) or changes in marine ecosystems (Emerton, 1999). MPAs also have a management cost and losses associated with those who are no longer able to benefit in the same way from the establishment of an MPA: e.g., anglers' benefits will decrease in terms of the number of fish caught.

2.4.2 Previous Studies on the Economic Valuation of Marine Resources

In terms of the total economic value of marine ecosystem goods and services, many scholars have examined specific characteristics of ecosystems in specific location (Ahmed, Umali, Chong, Rull & Garcia, 2007; Asafu-Adjaye & Tapsuwan, 2008; Carlsson, Frykblom & Liljenstolpe, 2003; W. Chen et al., 2004; M. Christie, Remoundou, Siwicka & Wainwright, 2015). For example, Asafu-Adjaye and Tapsuwan (2008) used the CVM to value the benefits of scuba diving in the Mu Ko Similan Marine National Park, Thailand. Scuba divers at this site (both local and foreign divers) were asked if they would be willing to pay a diving fee when they visited. These estimates were used to introduce an entrance fee system for the marine park. Carlsson et al. (2003) estimated the value of wetland atttributes in Sweden. The authors used the choice experiment method to investigate local residents' choice from hypothetical choice sets of wetland attributes (and the relative cost related to each choice). The wetland attributes introduced in the choice sets consisted of the vegetation, biodiversity, fish species, fencing waterline, crayfish species and walking facilities. In another study, M. Christie et al. (2015) valued the benefits from marine and coastal ecosystem services in the proposed MPA in St Vincent and the Grenadines, Caribbean. The respondents were locals and visitors who visited the MPA. The authors included six ecosystem service attributes (fish, coastal protection, health, ecosystem, beach and diving) under two scenarios (decline and improvement compared with the MPA status quo). The mean WTP revealed that the respondents were willing to pay more for ecosystem services to avoid future degradation of the services; however, the WTP values are were more elastic between locals and visitors.

Some authors have reviewed previous studies to estimate the general values of marine and coastal resources globally (Akhter & Yew, 2013; Cicin-Sain, 2014; Costanza et al., 1997; de Groot et al., 2012; Martínez et al., 2007). For instance, Costanza et al. (1997) aggregated the economic valuation of marketed or non-marketed recoverable ecosystem goods and services from over 100 valuation studies. In 1994, the total values of 17 major types of ecosystem goods and services were estimated at US$33 trillion per year. Of these, marine ecosystems contributed 63% of the total revenue, equivalent to about US$ 21 trillion per year. Martínez et al. (2007) calculated the total economic value of the Ecosystem Services Product derived from the coastal ecosystem in 122 coastal countries. The total estimated value equalled US$25.8 trillion per year. The authors emphasised that many coastal ecosystems are under modification (about 18% of the total land within 100 km of coasts). Although communities have increased their conservation efforts and introduced sustainable practices in the marine areas, the impact of human activities (the transformation of natural habitats and coastlines, over-exploitation, and species invasion by human vectors) on marine resources remain. De Groot et al. (2012) screened over 320 publications (665 valuations) between 2007 and 2010 to provide a comprehensive overview of values of 22 services from natural resources. Their study analysed the results of the total economic value of 10 ecosystem services that equalled 618,799 Int.$/ha/year[2] at 2007 prices. The most valued services are from coral reefs and coastal wetlands, with an estimated cost of 352,249 Int.$/ha/year and 193,845 Int.$/ha/year, respectively. The economic valuation studies of single MPAs, marine parks or coastal areas focus on three main concerns: (1) appropriate valuation methods being used for (total or partial) marine resource valuation; (2) analyses of institutional financial sustainability for MPA management; and (3) the total estimated value of marine resources by visitors' or residents' stated or revealed preferences.

Scientists are more interested in estimating the economic value of coral reefs in MPAs, especially in developing countries (Ahmed et al., 2005; Ahmed et al., 2007; Rolfe & Gregg, 2012; Seenprachawong, 2004; Thur, 2004; Tongson & Dygico, 2004; Yeo, 2005). Dixon, Scura and van't Hof (2000) expressed their interest in the economic valuation of coral reefs in the Bonaire Marine Park, Caribbean. In 1991, the marine park generated a total gross revenue of US$23.2 million from diving tourism (returns generated from accommodation businesses, restaurants, dive shops and retailers, transportation services, souvenir shops and other businesses). While the authors recommended that the number of dives in all diving sites of the marine park should be between 190,000 and 200,000 per year (within the threshold of carrying capacity), they estimated that it could be maximised to 400,000 (with no or minimum effect to coral reefs) if the MPA implemented diver education and enhanced management. Nevertheless, the total gross revenues from recreation-based tourism may increase by US$20 million or more per year. Ahmed et al. (2007) estimated the benefits from coral reefs in Bolinao, in the Philippines. Individual TCM and CVM were used to investigate the visitor demand and the WTP for coral reef conservation. The results showed the economic value from the CS was US$223 per visit or US$4.7 million per year. The average WTP value for coral reef conservation is surprisingly low compared with other studies which focus on the Philippines. The WTP estimate was only US$0.45 per visit compared with US$41 for the Tubbataha Reefs National Marine Park (Tongson & Dygico, 2004), US$3.7 for Anilao, US$5.5 for Mactan Island and US$3.4 for Alona Beach (Arin & Kramer, 2002).

CVM and TCM are popular valuation methods in studies on marine resources in MPA. While some studies use either CVM or TCM, others use both methods to estimate the TEV. Examples of studies that use the TCM and/or the CVM to value resources and attributes of the MPA are discussed in the next section.

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[2] Int.$ (international dollar), or the Geary–Khamis dollar, is a hypothesised currency unit that the authors used to unify all values across countries in one currency. This currency is based on the purchasing power parity (PPP) that one US dollar could buy in the US at a certain time. Conversion of this currency to other countries' currency is possible only by using the country's PPP, not the market exchange rate. 1Int.$=1 USD (de Groot et al., 2012).

2.4.3 Using TCM and CVM in Selected Economic Valuation Studies

Söderqvist et al. (2005) estimated the economic value of Swedish coastal zone areas. They employed TCM and CVM to estimate the economic value of improving bathing water quality and recreational fisheries in the Stockholm Archipelago. The purpose of estimating the economic values was to see if the development of environmental ecosystems was economically desirable. Improved bathing water (a one-metre increase in transparency) in the Stockholm Archipelago was estimated to have an economic benefit of SEK60 million annually (when calculated using TCM) for recreation and SEK500 million annually (estimated using CVM) for conservation. In contrast, the calculated cost to improve bathing water was SEK57 million annually. These results reveal a positive cost-benefit analysis for improved bathing water in the Stockholm Archipelago. Söderqvist et al. (2005) also used the conditional logit model to estimate the economic valuation of improved recreational fisheries or anglers' probability of choosing a fishing place from different fishing zones in the Stockholm Archipelago. The results were used to estimate the WTP for an increased fish capture per hour. It varied among different fish species. For example, each angler was willing to pay SEK56 if the weight of perch fish caught doubled from 0.8kg to 1.6kg per hour.

Lamberti and Zanuttigh (2005) conducted an economic valuation of the recreational beach at Lido Di Dante, Italy. The authors interviewed 600 respondents and used the CVM method. The study focussed on three beach characteristics: the status quo; a hypothetical situation based on a beach erosion scenario; and a hypothetical situation of a nourishment scenario. The results for the three scenarios showed that the mean daily use value of the Lido di Dante beach in summer was 27.67, 13.26 and 28.37 €/p/d[3], respectively. This value dropped to 4.10 €/p/d during the winter, three to seven times less than the value in the summer. As the beach is eroding, the visitors were asked about their choice of defence structures against the erosion. The results showed that 32.5% of the visitors preferred composite intervention (combining submerged breakwaters, groins and nourishment) because of its aesthetic attributes. This result implies that it is reasonable to construct a composite intervention to protect the beach against further erosion. Compared with the benefit from beach attributes derived by over 100,000 visitors per year who visited Lido Di Dante, the cost of composite intervention construction (€1 million) and maintenance (about 1/10 of the construction cost) is a reasonable amount to invest over a period of 10 years.

Asafu-Adjaye and Tapsuwan (2008) estimated the economic value of scuba diving in the Mu Ko Similan Marine Nation Park (Similan Islands), Thailand. The island attracts over 500,000 visitors per year. The authors used a dichotomous choice CVM to elicit domestic and international divers' WTP a scuba diving

[3] €/p/d: Euros/person/day

fee to the park. They used six econometric models for single and double-bounded dichotomous choices for three groups of visitors (domestic, overseas and combined visitors). Like other studies in developing countries (see Seenprachawong, 2002; Yacob et al., 2009), overseas divers were willing to pay more for diving than domestic divers. In a single-bounded dichotomous choice model, foreigners were willing to pay US$64.18 per year, whereas Thai visitors were willing to pay US$44.02 per year. However, the difference in the WTP estimates between the two groups was not significant in the double-bounded dichotomous choice model which recommended that a uniform diving fee should be applied to all visitors. The authors also found the estimated WTP was higher than the present diving fee (US$27.55 compared with US$4.8, respectively) which means the Management Board of the Marine Park should consider increasing the diving fee (by up to US$27.55). This would increase their benefits by US$932,520 per year.

Similarly, Yacob et al. (2009) used a dichotomous choice CVM to estimate visitors' WTP for eco-tourism resources. They conducted their survey in two selected marine parks in Malaysia, Pulau Redang and Pulau Payar. The authors used logit and probit models to estimate WTP for eco-tourism from different groups of domestic and international visitors. The results showed that the mean WTP values were between RM7.8 and RM10.6 per year for the Pulau Redang Marine Park, and between RM7.26 and RM7.95 per year for the Pulau Payar Marine Park. Total benefits from tourism were between RM4.25 million and RM4.7 million for Pulau Redang and between RM6.2 million and RM7.0 million for Pulau Payar. This means that the marine park management boards could apply a conservation or entrance fee to ensure the sustainability of the parks for the long term: at the time of the study, entry was free. The authors also found that respondents' WTP was significantly affected by price (the WTP bidding value), respondents' income and their home location.

Regarding the use of CVM to elicit respondents' WTP for conservation, some authors use a payment card format, instead of a dichotomous choice. For example, Ghosh and Mondal (2013) estimated non-use attributes from a coastal freshwater wetland in Chanda Beel, Bangladesh. The respondents were asked their preference of WTP for the wetland attributes, which include the existence of the wetland, the option of enjoyment of the wetland in the future, and the enjoyment of the wetland for future generations. The authors limited the interview time to twenty minutes ensure that respondents remained focussed. Ghosh and Mondal (2013) chose 250 households living in or around the wetlands to complete their survey. The respondents were aware of the relationship between the management of the wetland (e.g., multi-purposes in using wetland services) and their WTP for wetland services. However, 14.4% of the respondents were protest bidders and were excluded from the WTP models and WTP value estimates. Using ordinary least squares (OLS) regression, the results indicated that variables such as age, education and income, were significant determinants of respondents' WTP. The

WTP value decreased as age increased but increased with increased years of education and increased income. Not surprisingly, the mean WTP value in the study depended on the distance between the wetland area and the individual respondent's home. The closer to the wetland, the higher respondents' WTP. This is similar to Yacob et al.'s (2009) finding that people who live closer to ecosystems or environmental amenities are willing to pay more regardless of whether they are visitors or local residents.

Beside CVM, the individual or zonal travel cost method is widely used to estimate the value of environmental amenities and recreational areas. TCM is mostly used to estimate the benefit from direct use values of the environment. Mitrică et al. (2013) used zonal TCM to estimate the benefits from a nature preservation project in Harghita County, Romania. The zonal TCM is based on the number of visitors from each geographic zone relative to the total population of that zone expressed by the number of visits per 1,000 inhabitants in the zone (visitation rate measure). Mitrică et al. (2013) then calculated the CS from the demand function curve based on the visitation rate for one year. They tested the linear regression and cubic polynomial functions to determine the best-fitted models for the demand function, which depends only on an entrance fee (an independent variable). Their results indicated that the cubic polynomial function was the best-fitting model for the demand function in their case study. The authors' estimates showed that the value of CS and benefits (at 5.5% discount rate) derived from the recreational area (in 2013) were €6.715 million and €122.091 million, respectively. The authors recommended that if the government wanted to invest in a conservation/protection project in the study area, they should estimate the likely costs to ensure that the total cost (including investment cost, opportunity cost, operation cost, maintenance cost and other costs) is significantly less than the benefit value. This is to ensure the net present value of the investment project is positive because no entrance fee was imposed at the time of the survey.

Researchers in developing countries are particularly interested in the development of tourist industries and recreational enjoyment. W. Chen et al. (2004) estimated the recreational demand and economic value from tourism in Xiamen Island, China. The authors used zonal TCM to investigate the visitation rates and demand function of visitors from outside and those living on Xiamen Island. Like the above studies, the results showed that the visitation rate from further zones (to Xiamen Island) were lower than from the closer zone because travel costs increased with the increased distance between the visitors' zone of origin and the island. The authors developed two log-linear models of visitation rate. The results showed that the model based on visitors' total travel costs and income had a higher *Adjusted* R^2 value (0.84) than the model based on visitors' total travel costs and education (*Adjusted* R^2=0.77). The model with higher *Adjusted* R^2 was then used for an economic estimate. Based on the demand curve constructed from the visitation rate model, they were able to aggregate the recreational benefit from eastern beaches on the island. The US$53.5 million estimate shows the benefit derived from the recreational value of the eastern beaches of the island in 1999. The authors recommended that policy makers and managers establish a user access fee to balance the cost of maintaining the beach management and the benefit derived from the recreational beaches.

Zeybrandt and Barnes (2001) used both zonal TCM and CVM to estimate the recreational value of anglers' expenditure during their visits to a Namibian marine shore in 1998. Both foreigners and domestic visitors were involved in the survey, at 52% and 48% respectively. From the pre-test, the authors found that the question order related to respondents' cost should be re-constructed to avoid respondents misunderstanding the questions. They recommend that questions on travel costs should be asked first, followed by questions on the total cost of the trip and, finally, question(s) on specific costs, such as fishing costs. The authors tested five demand function models using linear–log function and found that the model with a mixed time cost independent variable was the best fit (compared with 100%, 60%, 30% and 0% time cost models). The finding is consistent with the authors' argument that the time cost must be excluded for respondents who enjoyed the time they spent travelling but included for those respondents who disliked the time they spent travelling. Combining those types of respondents' preferences, the mixed time cost model in the demand function should be applied. In the CVM, the authors used a payment card to elicit visitors' WTP from their return fishing trip. They then asked an open-ended question to elicit visitors' maximum WTP. Although the study used two different methods to estimate the CS for fishing trips, the results showed similar aggregated values for both methods. They elicited estimates of N$26.987[4] million and N$23.611 million from the TCM and CVM, respectively, for the aggregated CS. This finding contributes to the development of a solid policy platform for Namibian coastal management. The authors also found that the Namibian economy lost some of the benefits derived from foreigners' CS because no conservation trust fund had been established for marine resources conservation. Other developing countries may also incur similar losses because they do not have a system in place or only have a weak trust fund system.

TCM and CVM have been used in some studies to value marine resources in Vietnam. One early study, by Lindsey and Holmes (2002), estimated visitors' WTP for a protection programme in the Nha Trang Bay or support the establishment of the first MPA in Vietnam. The study used a CVM with payment card format to elicit visitors' mean WTP. The study proposed an entrance fee for three islands in Nha Trang Bay to cover the MPA's protection and management costs. The results showed that 81% of the surveyed respondents were willing to pay a positive amount to support the MPA. This figure was comprised of 83% of Vietnamese respondents and 72% of overseas visitors. The mean WTP was

[4] N$1.00 = US$0.20 in 1998 when Zeybrandt and Barnes (2001) conducted their survey.

approximately US$0.61 (1999) with the mean WTP of overseas visitors being three times higher than the Vietnamese visitors (US$1.48 and US$0.51, respectively). It was surprising to see that the foreign visitors would contribute more for the MPA than the Vietnamese visitors by paying a higher additional fee. The authors also found that changing payment values[5] had no significant impact on visitors' WTP. They used a series of values from US$ 0.50 to US$5.00 to elicit the visitors' WTP in a payment card format. Foreign visitors were more likely to recognise environmental and conservation problems and be willing to pay more with different preferences regarding payment mechanisms. They also included a foreign citizenship variable in the logit models to investigate its effect on visitors' perceptions of environmental problems[6] and their WTP for the MPAs protection programme. Foreign citizenship was statistically significant at the 5% level for both models. The findings also indicated a correlation between all visitors' income and education and their WTP, along with their awareness of environmental issues (statistically significant at the 5% level). Higher levels of education and a higher income level affected the respondents' WTP as well as their perceptions of environmental problems. This suggests that the establishment of the MPA is a good idea and would receive more support from visitors if environmental degradation was avoided.

Nam et al. (2005) estimated the TEV of coral reefs in the Hon Mun MPA in Vietnam (a similar location to Lindsey and Holmes' 2002 study) using TCM and CVM. However, they conducted their study after the establishment of the MPA. The authors calculated the net present value for different MPA management scenarios. Nam et al.'s (2005) results showed that the total MPA value was approximately US$7.47 million per year. This estimate was then used to derive values for two scenarios ("with management" and "without management") by aggregating the net benefits from the MPA for a period of 10 years (from 2005 to 2015). The authors synthesised the monetised values of reefs into a cost-benefit analysis for MPA management scenarios. The total net present values were US$70.3 million and US$53.8 million under "with management" and "without management" for the study period, respectively. The authors also recommended using a "user-fee" system to create sustainable support for the MPA's financial management. The system would produce revenue of approximately US$300,000 from booming tourism over the next couples of decades with the recommended fee of US$0.65 for non-divers and US$1.30 for divers. This would help improve local communities' livelihoods, eco-tourism development, and the conservation of marine biodiversity in the MPA.

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[5] After the first interviews, Lindsey and Holmes (2002) added three more, lower values of US$0.07, US$0.15 and US$0.35, to a series of values from US$0.50 to US$5.00 in a payment card format study because some of the interviewers complained about the high-lower value in the original payment scheme.

[6] Environmental problems include rubbish/litter on the beaches, water pollution, and interactions with vendors and beggars.

2.4.4 User Fee System and Cost – Benefit Analysis in the MPA Management

Many MPAs or marine areas are free access or they have a small or nominal user fee (Peters & Hawkins, 2009). For example, there was no access fee (at the time of study) to visit the Bonaire Marine Park (Dixon et al., 2000), the Anilao marine sactuary, Mactan Island and Alona Beach in the Phillipines (Arin & Kramer, 2002), Nha Trang bay MPA in Vietnam (Lindsey & Holmes, 2002) or newly established MPAs. Thus, many MPAs face a shortage of financial resources for their management and conservation programmes, not only in developing countries but also in some developed countries like the U.S. (Lindberg, 2001). Only 15.7% of reported MPAs have adequate funds for their conservation programmes (Peters & Hawkins, 2009). The Bonaire Marine Park in the Caribbean is a prime example of a "paper park": its entrance fee system has not been implemented since its establishment in 1981. This park overcame financial dificulties only when it introduced an administration fee in early 1990 (Dixon et al., 2000). Charging visitors an entrance fee, in addition to other funding sources (e.g., government funding, public donations or funding from other organisations), helps ensure an MPA's financial sustainability.

Economic valuation studies show that visitors are willing to pay more than the current MPAs user fees (see Ahmed et al., 2005; Cesar, 2000; Peters & Hawkins, 2009). Peters and Hawkins' (2009) study has revealed that some MPAs increased their entry fee after valuation studies. Table 2.2 shows the increase in user fees between the time of the survey and 2009 (as investigated by Peters and Hawkins, 2009) with reference to the respondents' mean WTP (those who visited marine areas during the survey period).

Charging an entrance fee or increasing an entrance fee from a nominal amount also helps local communities to capture scarce rental revenue from resources, which they no longer have access to when MPAs are established. Returns from a user fee would support and cover management costs and the costs for the enforcement of the anti-fishing regulation. A user fee also enables local authorities to manage the number of visitors and minimise the risk or damage to MPAs from tourism (Arin & Kramer, 2002). However, returns from an entrance fee should not totally replace all funds from the government or other organisations because there is always a risk of decreased visitor numbers due to unforeseen circumstances or external factors (such as natural disasters or closing the MPA due to for safety reasons). The returns generated from an entrance fee would then decrease and affect the MPA's financial sustainability (Peters & Hawkins, 2009).

How the entrance fee scheme is implemented in each MPA depends on information supplied by the WTP analysis of the particular MPA or other successful MPA entrance fee systems. For example, the entrance fee system applied in Bunaken MPA (Indonesia) was based on a diver and snorkeller fee system in Bonaire MPA (Carribean) (Peters & Hawkins, 2009). MPA management teams must consider the objectives of the fee, and advantages and disadvantages of applying visitor fees as well as the impact on other parties (such as tourist agents and local communities) (Lindberg, 2001).

Table 2.2 The increase in entrance fees in some marine parks

Author(s)/year of survey	Location	Mean WTP in study survey (US$)	Change in entrance fee per visit or dive*
Arin & Kramer, 1997	Anilao (Phillipines)	3.7	Increase from 0 to US$1.0
Arin & Kramer, 1997	Mactan (Phillipines)	5.5	Increase from 0 to US$1.0
Dixon et al., 1991	Bonaire MPA (Caribbean)	27.4	Increase from 0 to US$10 (general visitors) and to US$25 (divers)
Lindsey and Holmes, 1999	Nha Trang Bay (Vietnam)	0.61	Increase from 0 to US$2.5
Seenprachawong, 2000 & 2001	Phi Phi island, Andaman Sea (Thailand)	7.16	Increase from US$0.5 to US$6.0
Seenprachawong, 2002	Phang Nga Bay (Thailand)	4.2	Increase from US$0.5 to US$6.29**
Tapsuwan, 2004	Similan (Thailand)	27.05	Increase from US$4.8 to US$6.0
Walpole et al., 1995	Komodo Island (Indonesia)	11.7	Increase from US$0.87 to US$2 plus fee for length of stay (between US$15 and US$45)

Source: Adapted from Peters and Hawkins (2009), and Seenprachawong (2002)
** Between survey time and 2009; ** between survey time and 2019*

Using WTP analysis, some authors recommend applying a flat rate entrance fee to marine area visitors, since there is no difference in WTP values between different groups (e.g., domestic and overseas visitors). For instance, Asafu-Adjaye and Tapsuwan (2008) have proposed using a uniform entrance fee for all divers who visit the Mu Ko Similan Marine Nation Park, Thailand. Meanwhile, others have proposed different entrance fees for different groups of visitors. Seenprachawong (2002) have recommended using a two-tier basic entrance fee, based on WTP estimates, for entrance into the Phang Nga Bay, Thailand. The different fees are applied to different groups of visitors: Residents only pay an entrance fee of 40 baht (US$1.0) while foreigners must pay 400 baht (US$10.0) to visit this marine park. A two-tiered entrance fee (under the name of 'conservation fee') is also applied in marine parks in Malaysia, but there is no price difference between domestic and overseas visitors. The full fee is applied to adults and a half fee is applied to children, students and seniors (Yacob et al., 2009).

Revenue generated from tourism (recreational benefit) using an entrance fee system would create support for the maintenance and management of MPAs. In the case of the Bonaire MPA, after introducing an annual admission fee of US$10 per diver for two years, the park increased its revenue to over US$170,000 (1992). This revenue was enough to cover all the MPA's costs: staff salaries, operational costs and capital depreciation costs (Dixon et al., 2000). In the Tubbataha Reefs National Marine Park in the Philippines, a two-tier entrance fee system was applied to domestic and foreigner divers for two years, 2000 and 2001. The generated revenue covered approximately 28% of their annual recurrent costs and almost 41% of their protection costs (Tongson & Dygico, 2004).

As the importance of a user/entrance fee has become clear through WTP estimates, valuation studies have proposed a pathway for an existing entrance fee or a new pathway for entrance fee systems in MPAs. Free access and use of public environmental goods and services in MPAs (e.g., a recreational area or coral reef) will lead to inequity between visitors and locals, in the context of who is receiving the benefit. Locals (fishermen and others relying on fishing) are prevented from fishing and collecting marine resources to conserve biodiversity in the MPA; in other words, they lose revenue or their livelihoods. They will not support conservation if they are not compensated for their losses. Meanwhile, visitors and tourism operators pay nothing for the benefits derived from recreational activities in MPAs (Emerton, 1999). Moreover, free access will increase the number of visitors and lead to over-visitation (Lindberg, 2001). This will ultimately harm the marine resources and biodiversity in the MPAs.

MPAs are established to conserve marine resources' biodiversity. However, they need sufficient funds for their management and conservation programmes. Benefits derived from tourism and recreational activities in the MPA will help meet any financial deficits. However, when proposing/deciding management strategy alternatives for nature-based recreation in any MPA or coastal area, ecosystem utilisation, enjoyment and natural preservation goals, should all be satisfied (Ezebilo, 2016). MPAs must meet economic and environmental sustainability goals. Failure to meet these objectives will lead to the overexploitation of marine resources (focussing only on development activities), including over-fishing, tourism booms or increased pollution, and ineffective MPA management (or no management activities) because of a shortage of capital (ignoring other activities but conservation).

2.5 Chapter Summary

This chapter has discussed the concept of total economic value and how it has been employed to estimate the use and non-use values of marine and coastal resources. Previous studies have used various economic valuation techniques, including the Travel Cost Method and the Contingent Valuation Method, to elicit resource values from particular coastal areas, regions or global marine areas and coasts. This chapter has argued that the application of a user fee should be seriously considered to ensure the financial sustainability of MPAs. The next chapter presents the study's methodology. We use the Travel Cost Method the Contingent Valuation Method to investigate the recreation and conservation values of the CLC MPA.

Chapter 3

Research Methodology

3.1 Introduction

This study uses the TCM and CVM to estimate the economic values from the recreation and conservation of the CLC MPA. The Stata software was used to analyse the empirical models. Domestic and international visitors were analysed separately to test if there are any differences between the two groups in their WTP for conservation in CLC MPA. An econometric analysis of the combined group (all visitors) will be used to investigate the determinants affecting visitors' recreation demands and their conservation WTP.

This chapter is presented as follows: Section 3.2 describes the Individual Travel Cost and Zonal Travel Cost methods. Other concerns on TCM application are illustrated (the opportunity cost of time and multi-destination trips). Section 3.3 presents the use of CVM techniques to estimate a visitor's WTP for conservation in the CLC MPA: the payment card and double-bounded dichotomous choice. Section 3.4 summarises the chapter.

3.2 Travel Cost Method

The TCM was pioneered by Hotelling (1949) as a tool to evaluate the economics of recreation in U.S. national parks. It was then developed by Clawson and Knetsch (1966) to estimate outdoor recreation benefits. Willis and Garrod (1991) use two methods: zonal and individual TCM, to compare the CS from forest recreation. W. Chen et al. (2004) use TCM to estimate beach recreation values in Xiamen Island, China. Their results show a surplus of US$53 million was elicited from beach recreation. TCM was used in Latinopoulos' (2014) study to estimate the recreation benefits from protected riparian ecosystems in association with the impact of economic depression in Greece between 2009 and 2010.

Outdoor recreation is a significant activity in coastal and marine areas and the economic value associated with enjoyment is substantial. Coastal resources, such as beaches, marine parks and coral reefs, are usually open to the public for entertainment free of charge or at a nominal fee. Although these resources are valuable for recreation, the lack of free-market price information prevents value estimates using market methods. Thus, the recreation value is obtained from the engagement of an individual in costly travel and other observable behaviours. Data on these behaviours can be used to indirectly estimate associated economic values (Holland, Sanchirico, Johnston & Joglekar, 2010).

TCM is a non-market valuation method that is used to estimate the value of environmental goods and services for recreation. It is based on actual behaviour and choices of visitors and is less expensive to implement (Belt & Cole, 2014). This method employs the travel costs to visit recreational areas as a proxy to calculate the demand for recreation. For example, Seller, Stoll and Chavas (1985) use fuel costs incurred by recreationists to visit one of four lakes in East Texas, U.S. to calculate travel costs for recreational boating demand. Other costs incurred during the respondents' trip, such as user fees or launch fees, were included in their demand models as separated cost variables. Smith, Desvousges and Fisher (1986) use distance for the return trip and per mile cost (U.S. 8 cents) to calculate visitors' travel costs from their home to water-based recreation sites.

There are some standard neoclassical assumptions on people's behaviour for their choice to consume goods (or services). First, people have their preferences, which dominate their choices among the many other offered goods (or services). Secondly, people will always prefer more of a good to less. When receiving more of a good, consumers can use what they require leaving the possibility of giving a part of it away, which creates extra benefits for themselves from the giving. Lastly, consumers' preferences are transitive, which means if consumers prefer good A to good B, but prefer good B to good C, they logically prefer good A to good C (Ward & Beal, 2000). Consumers, then, are aware of their choices to maximise their utility subject to the constraints of their budget and time (Ezebilo, 2016; Ward & Beal, 2000).

The basic assumptions underlying TCM include the cost that each visitor incurs when travelling to the recreational site resulting in the disclosure of personal valuation from each individual at that site. Both increased entry fees and travel costs will affect the visitors' reaction with the same attitude (Asafu-Adjaye, 2005; Becker et al., 2005). The last assumption is that an increase in the distance (between home and recreation site) will result in a decrease in the frequency of trips made by an individual (Ezebilo, 2016). Ezebio's (2016) study shows that visitors who lived 0-5 km from a recreation site visited the site over nine times more than the respondents who lived 51-80 km from the site (109 versus 12 trips per year, respectively). Each visit made by a visitor is considered an individual transaction resulting in the travel cost incurred from that visit being treated as a proxy for that transaction (Wilson & Carpenter, 1999). The travel cost to a site contributes a significant part to the full cost of the trip and it varies widely across any sample of the population at any given site (Freeman, 1993). That is, at some high level of the entry fee (or cost of travel) no one would visit the site because it was too expensive (Asafu-Adjaye, 2005).

There are two alternative forms of TCM: the Zonal Travel Cost Method (ZTCM) and the Individual Travel Cost Method (ITCM). In practice, the recreation demand for a particular site is estimated at an individual level. Based on that, recreation values are estimated by summing all individuals' values for the site (Freeman, 1993). In the other words, individual demand TCM is generated from visits of individuals (the demand for the site) and the price of the site (the travel cost incurred to make a visit) (Turner, 1993). The recreation demand model is constructed based on the originating region of visitors, called the zonal variant. Zones of visitors are the dependent variable in the TCM model, which also depends on the price factor of the recreation site (the travel cost from the originating zone to the site) (Turner, 1993). Asafu-Adjaye (2005) introduced these two forms of TCM in his book with a combination between TCM and CVM called Hedonic TCM. This method estimates the respondents' WTP for separated characteristics of the recreation experience. To do that, it first regresses the travel cost on the demand of the respondents for each recreation characteristic. Then, it constructs the demand curve for the single characteristics of the recreation site.

3.2.1 Individual Travel Cost Method

According to Asafu-Adjaye (2005), the ITCM determines the number of trips that an individual visitor makes to a particular recreational site in one period as the dependent variable. This dependent variable is used to generate the demand curve function for visitors; it would be affected by some explained variables, such as visitors' income or visitors' travel costs.

Briefly, the travel cost procedure involves two steps: an estimation of the demand function for recreation and the construction of the demand curve for recreational consumption. The demand curve is constructed using assumed increasing travel costs or user fees (Ward & Beal, 2000). The next step, CS estimation, plays an essential role in valuing the welfare of recreationists to recreational areas as well as in comparing non-marketed and marketed commodities' consumption, for example, comparing the value of beaches and the value of fishing (Rolfe & Gregg, 2012).

The single-site demand function for the ITCM or trip-generating function is given as follows (Asafu-Adjaye, 2005; Nam & Son, 2001; Turner, 1993; Willis & Garrod, 1991):

$$\mathrm{N}_i = f(TC_i, X_i) \qquad (3.1)$$

In equation (3.1), the number of visits N_i made by individual *i* to the site in a given of time period (year or season) is a function of the travel cost TC_i incurred by individual *i* to visit the site and socio-economic factors X_i affecting the individual *i*'s visit. Those factors may include income, days spent on the site, substitute costs, age, gender, occupation, or education level.

The full price of travel for a visit consists of two components: the trip cost (the out-of-pocket expenditure), and the opportunity cost of time (Benson, Watson, Taylor, Cook, & Hollenhorst, 2013).

The travel expenditure consists of the total cost for fuel of return trip from a respondent's home to the recreational site if he/she uses his/her own vehicle, and onsite expenditure (Zeybrandt & Barnes, 2001). The fuel cost only includes the cost of operation, such as fuel, and excludes the costs of vehicle ownership such as insurance and depreciation incurred whether or not the trip operates (Benson et al., 2013). If visitors do not use their own vehicle for travelling but rent a vehicle, the travelling cost will include their rental fee for hiring the transport plus fuel for their trip from home to the site and return. Otherwise, travel cost will equal return fares from the visitor's home to the recreation site if visitor travels by plane, bus or other public transport (Hill, Loomis, Thilmany, & Sullins, 2014).

The expenditure of the full price is set as the minimum amount to support a visitor travelling from their origin to the recreational area (exogenous cost). Exceeded expenses over the exogenous cost during the trip would be assumed for other arbitrary goods for that visitor who received the additional benefits. For example, the cost of luxury accommodation and restaurants should be excluded from the travel cost because they would overstate the benefits received from the recreational site alone (Benson et al., 2013).

The TC_i variable measures the marginal cost of travel for the trip of each individual *i* from his/her home to the recreational site, based on the stated expenses of an individual. It is the function of costs as follows:

$$\mathrm{TC}_i = f\{(C_{ifuel}, C_{irental}, C_{ifare}, C_{ionsite}) + k\ (W_{irate} * T_{itt-st})\} \tag{3.2}$$

Where C_{ifuel} is the cost for fuel for the return trip from visitor's home to the recreational site. $C_{irental}$ is a rental fee for hiring a vehicle for the trip. C_{ifare} is the fare (flight, travel by bus or public transportation) from the visitor's home to the recreational site. $C_{ionsite}$ is the total expenditure that the visitor spends onsite (including entrance fees, accommodation, dining, and other related expenses). W_{irate} is the monthly income divided by 176 hours (22 days per month x 8 hours per day) to elicit the estimated average hourly wage rate. The working hours for full-time work are assumed to be 40 hours per week. Visitors who are students, unemployed or homemakers, are assumed to have a zero wage rate. T_{itt_st} is the traveling time and time spent onsite.

The opportunity cost of time includes time spent to travel and time spent onsite (T_{itt_st}). It is calculated based on the individual's wage rate (W_{irate}). It is some proportion of wage rate (*k*) varying between 0 and 1. The opportunity cost of time will be discussed further in section 3.2.3.

Three models can be applied for the trip generating function, the traditional model, the McConnell-Strand model, and the two-step decision model (McKean, Johnson, & Taylor, 2012). The essential difference between the three models depends on the value of *k* – the constant value to estimate the opportunity cost of time. In the traditional model, the researchers set the value of *k* constant at some fraction of the wage rate, e.g., a quarter to a half of wage rate (McKean et al., 2012; Ward & Beal, 2000). The value of *k* in the McConnell-Strand model, on the other hand, is estimated in the model itself. McConnell and Strand (1981) estimated *k* at about 0.61 of the wage rate when valuing the recreation demand for sport fishing in Chesapeake Bay, U.S. This *k* value might be used in other similar analyses of travel costs for recreation.

The two-step decision model has an extraneous relationship between *k* and the wage rate. This model implies the demand for recreation is a short-run decision (versus a long-run decision that is mostly related to life decisions such as investment in education, house or career). The labour market is perfect and in equilibrium only in the long-run decision. The exogenous wage rate then does not measure endogenous time value for the demand for recreation, a short-run decision (McKean et al., 2012).

- **Demand Function Model Estimation**

As the nature of non-negative and integer data on the number of trips, the Poisson and non-negative binomial count data regression is the most fitted for a single-site travel demand model other than traditional estimation of OLS. OLS requires a continuous distribution of the dependent variable, which is not satisfied with a number of trips. Moreover, OLS linear models produce negative predicted values, which are not possible for a count variable. As a result, OLS assumptions are not fulfilled and OLS estimation may be biased (Chae, Wattage, & Pascoe, 2012; Cooper & Loomis, 1993). The Poisson and negative binomial model assign positive attributes to non-negative integers of count data (Hill et al., 2014). However, the estimates vary between Poisson and negative binomial regression models and significant errors may occur if the wrong model is chosen (McKean et al., 2012).

<u>The Poisson Regression Model</u>

Following A. Cameron and Trivedi (1998), Latinopoulos (2014), and Martínez-Espiñeira and Amoako-Tuffour (2008), the formula gives the probability distribution of a Poisson random variable N representing the number of trips taken by each respondent to the recreational area in a given time:

$$\Pr(\mathrm{N} = N_i | x_i) = \frac{e^{-\lambda_i}\ \lambda^{N_i}}{N_i!} \qquad (3.3)$$

Where: λ_i is both the mean and the variance of the random variable N (expected number of visits) and supposed to be a function of all independent variables described in equation (3.1).

$$E(N_i | x_i) = Var(N_i | x_i) = \lambda_i = \exp(x_i'\beta) \qquad (3.4)$$

Equation (3.4) presents the exponential mean function (A. Cameron & Trivedi, 1998) or equi-dispersion property of Poisson regression models (Latinopoulos, 2014), which assumes that the conditional mean and the variance of the random variable N_i are equal.

The log-likelihood function of the trip demand for the standard Poisson regression model is the semi-log function of travel cost and other independent variables (Englin & Shonkwiler, 1995; Loomis, 2006; Rolfe & Gregg, 2012). This relationship is given in equation (3.5):

$$\ln \lambda_i = \beta_0 + \beta_1 TC_i + \cdots + \beta_n X_n \qquad (3.5)$$

The equi-dispersion assumption of the mean and variance (of the number of trips) is usually violated in the Poisson model because this model limits the conditional mean of its distribution to be equal to the variance (Mwebaze & MacLeod, 2013; Rolfe & Gregg, 2012). Specifically, a large number of visitors create a few visits and a small number of visitors create more trips to the recreational site. Consequently, the variance of trip demand is expected to exceed the mean, resulting in the over-dispersion problem of the model (Latinopoulos, 2014). Over-dispersion occurs when the mean is smaller than the variance, whereas under-dispersion occurs when the mean is greater than the variance.

Over-dispersion has similar consequences as heteroskedasticity in the linear regression model that underestimates the standard errors and inflates the *t*-statistics in maximum-likelihood output (Latinopoulos, 2014; Martínez-Espiñeira & Amoako-Tuffour, 2008). The over-dispersion problem makes the Poisson model more restrictive. In this case, an alternative measure is the negative binomial regression model. This model has the same mean structure as the Poisson model but includes an additional parameter (α) that express the dispersion of the unobserved heterogeneity. The negative binomial relaxes the equi-dispersion assumption and allows the variance to vary (Cooper & Loomis, 1993). Over-dispersion of the model can be tested by implementing a log-likelihood ratio test based on the parameter α.

<u>The Negative Binomial Regression Model</u>

This model is widely used in many studies. Englin and Shonkwiler (1995) use the negative binomial regression model to estimate the total trips and WTP of Washington state, U.S. residents, for hiking demand in the Cascade Mountain Range. Rolfe and Gregg (2012) use the negative binomial model inflated corrrection with zero visits, to estimate beach recreation demand along the Queensland coastline, Australia, from respondents living in six regions along the coast. Mangan, Brouwer, Lohano and Nangraj (2013) use zero-truncated negative binomial model, along with two other models (Poisson regression and zero-truncated Poisson), to estimate the trip demand for Ramsar Keenjhar Lake in Pakistan. Latinopoulos (2014) uses a similar model to estimate the demand for eco-tourism in the Nestos River of Rodopi National Park, Greece.

The distribution of a random count variable N be Poisson, conditional on the parameter λ; we have equation (3.6) as follows:

$$\Pr(N_i|\lambda_i) = \frac{e^{-\lambda_i}\ \lambda^{N_i}}{N_i!} \qquad (3.6)$$

Suppose that the parameter λ_i is random, $\lambda_i = \exp(\beta'\mathbf{x}_i)$ is the conditional mean function, and α_i is the over-dispersion parameter, the negative binomial density will be obtained from equation (3.7) (Latinopoulos, 2014; Martínez-Espiñeira & Amoako-Tuffour, 2008):

$$\Pr(N = N_i|\boldsymbol{x_i}, \alpha) = \frac{\Gamma(N_i + \alpha^{-1})}{\Gamma(\alpha^{-1})\Gamma(N_i + 1)} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \lambda_i}\right)^{\alpha^{-1}} \left(\frac{\lambda_i}{\alpha^{-1} + \lambda_i}\right)^{N_i} \qquad (3.7)$$

Where Γ(.) is the gamma function. The vector $\boldsymbol{x_i}$ represents the set of independent variables reported for each individual *i*. The vector β is parameters to be estimated from the observed individuals. The parameter α is to determine the dispersion of the model. If the value of α is larger, over-dispersion is greater. Exceptional cases of α occur when it equals to zero (α = 0), the model then reduces to the Poisson, and when it equals 1 (α = 1), the model is a geometric distribution.

- **Consumer Surplus**

The individual CS can be obtained by integrating the area under the individual demand curve for the travel cost between the price paid and the choke price[7]. In other words, the individual CS is the area under the demand curve and above the price paid line (the grey area (a) in Figure 3.1). It can then aggregate the total visitors' benefits (total visitors' CS) by multiplying individual CSs by the number of visitors in a given time (one year or one season) (Asafu-Adjaye, 2005; Latinopoulos, 2014; Nam & Son, 2001).

Following Latinopoulos (2014), the general CS per individual is calculated as in equation (3.8):

$$CS_i = -\frac{\lambda_i}{\beta_c} \qquad (3.8)$$

Where: CS_i is the CS for individual *i;* λ_i is both the mean and the variance of the random variable N (expected number of visits); and β_c is the travel cost variable coefficient.

[7] The choke price is reached when the travel cost variable increases until zero visits are obtained (Fleming & Cook, 2008).

The CS per visit is equal to estimated CS divided by the average visits that each individual makes in a given time, which is described below:

$$CS_i = -\frac{1}{\beta_c} \qquad (3.9)$$

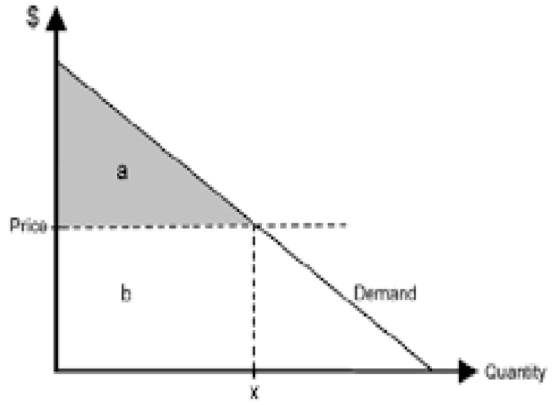

Figure 3.1 The consumer surplus from trip generation

As indicated by Turner (1993), an estimate of total CS for a recreational area is generalised by multiplying individual CS by the number of recreationists in a given time:

$$\text{Total CS} = N_j \int f(\mathrm{T}C_{ij}, X_i).\, dC_{ij} \qquad (3.10)$$

Where: N_j is the total number of visits to site *j* per year or season and (TC_{ij},X_i) is defined as the number of visits made by individual *i* to site *j*.

- **Zero Truncation and Endogenous Stratification**

In an onsite survey, there are two concerns with the demand function model: truncation and endogenous stratification. An onsite survey does not count zero trip visitors who do not make any trip to the site. It means that only visitors who made the trip(s) to the site are included in the individual demand model; non-visitors are excluded from the sample, which is called truncation. Therefore, the demand model for trips is truncated at zero. If truncation is not accounted for, the estimates may be biased and inconsistent because the conditional mean is miss-specified (Mangan et al., 2013).

The second problem of the onsite survey is endogenous stratification, which is related to the probability of visitors being surveyed. A visitor making frequent visits to the site has a higher probability than a visitor who makes fewer visits in terms of being observed. Endogenous stratification will make the sample selection biased (Benson et al., 2013; Englin & Shonkwiler, 1995; McKean et al., 2012; Mwebaze & MacLeod, 2013).

Considering these two problems in an onsite survey, the Poisson and negative binomial models can be adjusted for truncation and endogenous stratification. The zero-truncated Poisson/negative binomial distribution is introduced to solve the problem of truncation and endogenous stratification. The Poisson regression is adjusted by giving the condition of count variable being higher than zero (truncation) and deducting one from this dependent variable from the right side of equation (3.11) (endogenous stratification) (Mangan et al., 2013).

$$\Pr(\mathrm{N} = N_i | N_i > 0) = \frac{e^{-\lambda_i}\lambda_i^{(N_i-1)}}{(N_i-1)!} * \frac{1}{1-e^{-\lambda_i}} \qquad (3.11)$$

Equation (3.11) holds when the sampling data are equi-dispersed. If over-dispersion occurs, the zero-truncated negative binomial model with endogenous stratification correction should be applied (Benson et al., 2013; Englin & Shonkwiler, 1995; Mangan et al., 2013). The probability of the distribution is presented in equation (3.12).

$$\Pr(\mathrm{N} = N_i | N_i > 0) = N_i \frac{\Gamma(N_i + \alpha^{-1})}{\Gamma(N_i + 1)\Gamma(\alpha^{-1})} \alpha^n \lambda_i^{N_i-1} (1 + \alpha\lambda_i)^{-(N_i+\alpha^{-1})} \qquad (3.12)$$

Where 1/α is a parameter of dispersion degree that is added to the model to control the over-dispersion and α is the heterogeneity parameter.

3.2.2 Zonal Travel Cost Method

ZTCM developed by Clawson and Knetsch (1966) assumes that the variability of visitors' frequency rates depends on their origin (higher distance from the recreational site to visitor's home is always associated with increased travel costs). In other words, ZTCM portions the entire area from which visitors originate into a set of visitor zones and then defines the dependent variable as the visitor rate (i.e., the number of visits made from a particular zone in a given time divided by the population of that zone) (Gürlük & Rehber, 2008; Turner, 1993; Whitten & Bennett, 2002; Willis & Garrod, 1991).

ZTCM is often used when visitors make only one or a few trips in a given time to the recreational site. ZTCM is suitable to employ a demand function for visitors who are far away from the recreational site or visitors who must travel for a certain distance from their home to the site. ZTCM is suitable for heterogeneous sample population regarding travel distances, demographics, and socio-characteristics (Zeybrandt & Barnes, 2001).

Zones are based on geographical units such as the concentric areas radiating from the recreational site, the intervals of distances, or by administration areas. Each visitor is assigned a zone where she or he originates. The ZTCM then aggregates data from zones of visitors to elicit their revealed references for recreational demand. However, the selection of zones influences the ZTCM, which may affect CS estimation (Zeybrandt & Barnes, 2001). Zoning the visitors, thus, needs to be carefully identified in terms of sample homogeneity.

ZTCM offers several advantages for decision makers compared with ITCM. ZTCM combines data of visitors' demographics, and references from different zones. The result of this data analysis shows the preferences of visitors for recreation sites. It also reveals the frequency of visitors to recreation sites from zones in the changes of quality and facility supplies of the recreation site. Based on that, managers and policy makers can recognise what stimulation effects of cost and benefits change with changes in management and decide how to change or improve the recreation quality and facilities. Besides, ZTCM is transferable from studied site to unstudied site. It is expected to transfer models in the absence of estimating new parameters for unstudied recreation areas (Ward & Beal, 2000).

As previously discussed, non-visitors who make no trip to the site is a problem in ITCM in that the onsite survey excludes them. In ZTCM, those non-visitors are included in the data set and then the model because ZTCM is based on the demographics of zones where visitors come from so non-visitors from those zones are present in the survey sample (Cooper & Loomis, 1993). The problems of truncation and endogenous stratification from onsite survey data do not occur in ZTCM. Therefore, no additional distributional assumptions are needed for the explained variable in ZTCM models (Moeltner, 2003).

The recreational demand function in ZTCM is based on the visitation rate of visitors from different zones (as the dependent variable), and travel cost and other demographic variables (as the independent variables). The zonal visitation rate is calculated by dividing the number of visitors making the trip(s) to the recreational site by the total population in the original zone of the visitors. It is usually represented by the number of visitors per 1,000 inhabitants in each zone (Mitrică et al., 2013).

The basic model of travel cost demand per capital is presented in the following equation (3.13):

$$V_i/P_i = f(TC_i, X_i) \qquad (3.13)$$

Where: V_i is the number of visits from zone *i* to the site; P_i is the population of zone *i*; TC_i is the travel cost incurred by visitors from zone *i*; and X_i is a vector of socio-economic variables that explain changes in V (e.g., income, education or age). The visitation rate (V_i/P_i) is calculated as visits per 1,000 inhabitants in zone *i*.

The form of the demand function may be linear, semi-log, or log - log. Becker et al. (2005), Cooper and Loomis (1993), and Mitrică et al. (2013) use the linear form whereas other studies use the log-linear function to estimate the recreation demand (W. Chen et al., 2004; Fleming & Cook, 2008; Zeybrandt & Barnes, 2001). However, the model's precision does not depend on the complexity degree of the demand model (Mitrică et al., 2013). The following are four functional forms of the demand function that will be used in this study:

Linear function: $V_i/P_i = \beta_0 + \beta_1 TC_i + \beta_2 X_i$ (3.14)

Log-linear function: $\log(V_i/P_i) = \beta_0 + \beta_1 TC_i + \beta_2 X_i$ (3.15)

Linear-log function: $V_i/P_i = \beta_0 + \beta_1 \log(TC_i) + \beta_2 X_i$ (3.16)

Log-log function: $\log(V_i/P_i) = \beta_0 + \beta_1 \log(TC_i) + \beta_2 X_i$ (3.17)

Given the demand function is linear for visits to the recreation site, the recreational value (total CS) can be estimated using the integral formula (Cooper & Loomis, 1993). Assume a visit is a single-site trip.

$$CS = \sum_{i=1}^{z} P_i \int_{TC}^{TC_{max}} (\beta_0 + \beta_1 TC_i + \beta_2 X_i) d_{TC} \qquad (3.18)$$

Where: TC_{max} is the choke price; β_0, β_1, and β_2 are coefficients of the model, the travel cost, and socio-economic variable, respectively; and P_i is the population of the zone *i* (*i=1,2,… z*). The 'choke' price occurs when the travel cost increases to a maximum, driving the visitation rate to zero (Ward & Beal, 2000).

- **Elasticity of Demand**

Elasticity is the responsiveness of a quantity demand to a small change in one of its determinants. Managers and policy makers rely on demand elasticity information of recreational areas and use that information to predict the change in demand of recreational facilities and services if one or some determinants changes (such as price or substitute sites). The prediction of the elasticity of demand is also helpful in estimating the recreational valuation even if the determinant variables do not control the demand (Ward & Beal, 2000).

Elasticities consists of price elasticity, substitute price elasticity, income elasticity, and advertising elasticity. Price elasticity is notably regularly estimated (Moeltner, 2003; Ward & Beal, 2000). Price elasticity represents the difference between changes in the quantity of goods or services and the price of those commodities (equation 3.19). Price elasticity has values from 0 to ∞ in which an inelastic price is between 0 and 1. If the change of a quantity over change in price is equal to or more than 1, price elasticity occurs in the demand for the consuming commodity (Ward & Beal, 2000).

$$E_p = \%Q/\%P = \Delta Q/\Delta P \times P/Q \qquad (3.19)$$

Where: E_p is the price elasticity; %Q is the change in the quantity of recreational services; and %P is the change in the price of demand (in percent). When E_p is between 0 and 1, the demand is insensitive to the changes in price. Managers may increase total revenue by increasing the price of inelastic recreational services.

Income elasticity measures the difference between changes in the quantity of goods/services and changes in consumers' income (%ΔQ over %ΔY where Y is the income of consumers). If the income elasticity is positive, increased income will promote increased demand for commodities. On the other hand, if it is negative, a rise in consumers' income will decrease demand. The income elasticities for recreation vary at different levels of income (Ward & Beal, 2000).

3.2.3 Value of Time Cost

There are two issues related to time in the TCM: travel time and time onsite. The value of this time is treated as an opportunity cost because visitors do not have to pay for their travel time and onsite time, but they must give up their other earning jobs to spend time on their trip. Besides, the exclusion of time costs in the demand function estimate would exaggerate the influence of price changes resulting in underestimating the CS (Bockstael, Strand, & Hanemann, 1987).

The travel time should be calculated as a component of travel cost for demand estimate to visit the recreational site to avoid multi-collinearity between the travel cost and opportunity cost variables (Bockstael et al., 1987). Since time is a cost that must be measured in monetary units, the observed time cost must be converted into a monetary value with the use of an appropriate shadow price of time (Freeman, 1993).

Similarly, onsite time should be considered as a proportion of the travel cost to visit a recreation site. It should be included in the estimates of the recreational demand function (Freeman, 1993). Otherwise, it would downward bias the estimated CS. Under the condition of no contradictory evidence, the benefit of recreationists' onsite time is equal or exceeds the onsite time cost because consumers are willing to pay more for their visits (Ward & Beal, 2000).

Regarding time pricing, the choice of the time shadow price is essential for both the demand elasticity estimate and the valuation of recreational sites. The higher the price, the more critical time cost is in terms of interpreting trips as a function of distance. A higher shadow price leads to a smaller predicted decrease in the number of trips caused by the increase in travel cost to the recreational site. As a result, the demand is less elastic when constructing the demand curve. Nevertheless, the side effect of a high shadow price (especially when it is too high) is to upward bias the elasticity estimate and downward bias the benefit evaluation (Freeman, 1993). Ward and Beal (2000) list alternative prices for the opportunity cost of time from previous authors, of which wage rate is used as a proxy for time price with different proportions. Cesario and Knetsch (1970) recommend a third to a half of the wage rate whereas McConnell and Strand (1981) introduce over 60% of wage rate to calculate the opportunity cost of time.

It is important to consider that consumers are free to choose to work in an uncomplicated environment with their demand for a particular wage rate. There would be a trade-off between work and recreation, including self-employed persons or employees with part-time jobs or second jobs (Freeman, 1993; Ward & Beal, 2000). However, Ward and Beal (2000) indicate that, in modern industrialised countries, individuals have their earnings from wages and paid holiday leave (for weekends and public holidays). The paid holiday is considered a recreational vacation. Thus, the opportunity cost is irrelevant as individuals spend their recreation trips at suitable times and do not work on those holidays. Moreover, if the visitors show that "they have nothing else to do" or they do not create income from working (e.g., students or homemakers), the opportunity cost of time for visiting should be considered zero.

3.2.4 Substitute Sites and Multi-site Trips

3.2.4.1 Substitute Sites

The main recreational site and substitute sites within the region are available for visitors to choose for a visit; their choice depends on the price of each site as well as other factors. The estimate of CS of the recreational site by TCM may be biased if substitute sites are not analysed (Freeman, 1993; Ward & Beal, 2000; Willis & Garrod, 1991). However, it is difficult to gather data for substitute sites from visitors as they would fail to answer or feel difficult about responding to substitute site-related questions (Willis & Garrod, 1991).

The bias of the demand curve because of omitting substitute site prices depends on the correlation between prices of the study site and substitute sites. Two different relationships may occur giving a positive or negative correlation. If a positive correlation, the substitute price omission will bias the price elasticity of the study site close to zero (price elasticity in regression analysis is closer to zero than price elasticity in an experiment with increasing travel cost). Conversely, overstatement of the studied price coefficient will occur with a negative correlation between those prices. In short, there is a trade-off in including substitute prices in the travel cost regression models. There are two pathways to deal with substitute site prices. If substitute prices are included in the models, there is a potential correlation between substitute prices and the studied price, which reduces the standard errors of the models and generates unstable estimated price elasticity. On the other hand, omission of substitute prices from the models will bias the demand curve but keep price elasticity stable (Ward & Beal, 2000).

3.2.4.2 Multi-sites or Multi-purpose Trips

One more concern relating to estimation by the TCM is to deal with multi-site visits; visitors may not visit a single recreation site on their journey but include some other places as a bundle commodity. The single-site trip involves only a one-purpose visit to a recreation site by an individual who directly travels from the home to the site and then returns home without stopping at or visiting the other places. Therefore, all their travel costs, time costs, and out-of-pocket expenditure is a proxy for the price of their trip. A multi-site trip, on the other hand, is a journey on which recreationists visit a particular site and several nearby sites (or sites between their home and the particular sites) (Loomis, Yorizane & Larson, 2000). The travel cost for a multi-purpose trip is then a joint travel cost to visit all sites during the trip and cannot be considered the price for only a particular site (Ward & Beal, 2000).

Haab and McConnell (2002) assume recreation trips are only single-site to estimate the demand for travel and CS because the model of multi-site trips is challenging to manage, particularly for long trips. It becomes more complicated when a one-day trip becomes a trip to several destinations. This assumption is supported by Asafu-Adjaye (2005) that multi-site recreationists should be omitted from the model because of the difficulty in allocating costs among multi-sites as recreationists spontaneously assign their prices to the different sites. However, TCM will underestimate the total benefits for a single particular site and overestimate the CS per person if multi-purpose trips or multi-site trips are omitted from the model (Fleming & Cook, 2008). The alternative is to interrogate the multi-site trip by studying visitors who divide their proportional cost of study site out of total travel cost (Asafu-Adjaye, 2005; Fleming & Cook, 2008) or divide their total cost by length of stay at each recreational site (Loomis et al., 2000)

The solution of treating sites as a bundle is also applied in some studies such as in Saenz (2001). The bundle of sites is treated as one good or service in the recreation demand estimate. It means that visits to complementary or secondary sites are added to the primary site as one bundle in the demand model by assigning a multi-site trip variable as a dummy variable to differentiate from a single-site trip variable in the regression. With the presence of complementary activities and sites, the dummy variable of the multi-site trip will shift the demand function between the single-site trip and multi-site trip models. Meanwhile, the rotation from single-site trip to multi-site trip model will be captured by the interaction between this dummy variable and the price (Loomis et al., 2000).

3.3 Contingent Valuation Method - WTP Empirical Model

In this study, CVM is used to estimate the WTP of visitors to the conservation of the CLC MPA. CVM was chosen in preference to choice experiment because our study solely and directly focuses on the eliciting the values of environment and resources (M. Christie et al., 2006; Black, Milner-Gulland, Sotherton, & Mourato, 2010). In this case, we focus on the visitors' contribution for conservation of the CLC MPA by paying additional entrance fee. It is directly related to policy decision on increasing entrance fee (and possibly decrease the number of visits to reduce pressure on the MPA). Meanwhile, choice experiment focuses on attributes of the marine resources and management scenarios of resources attributes (Bennett and Blamey, 2001). It may mix up resources' attributes and come up with policy irrelevant combination (Black et al., 2010). In addition, the trade-off between various attributes of coastal and marine resources, normally resolved in choice experiment, are not a concern in this study. Similar to Black et al.'s study (2010), CVM is more appropriate in this study. CVM is also flexible and more suitable in developing countries like Vietnam where visitors' knowledge on environmental protection and biodiversity conservation is limited. Moreover, it is appropriate with the time constraint. Visitors do not have to spend much of their time on understanding scenarios/proposals that are normally used in the choice experiment's questionnaires.

CVM is a survey-based method (Day & Maurato, 2002) that can be applied to estimate non-use values for marine and coastal resources, such as existence values of marine resources (for conservation or preservation for future generations) (Hall, Hall, & Murray, 2002). It involves describing the marine and coastal goods and services to the respondents, using various information provision instruments (e.g., choice experiment on natural resource attributes or bidding a value on environmental characteristics), and the precise changes that will occur in marine and coastal areas (Carlsson et al., 2003; Carson, 2012; Louviere, 1994). This technique creates a constructed market or hypothetical market for a nonmarket commodity of interest. The survey typically presents respondents with a single (or small number) of hypothetical goods/services or a policy change based on an actual goods or services, such as marine resources, for which values are desired (Holland et al., 2010). The CVM and other stated preference methods have been widely used because they can contribute to elicit non-use values of environmental goods and services as well as to accommodate any quality changes of environment or natural resources that have not yet happened (Belt & Cole, 2014).

CVM is used to estimate values of not only marine resource services but also other environmental commodities such as freshwater bodies (including groundwater), bathing water, fishing sites, natural parks, and wetlands. The basic underlying idea of CVM is an appropriately designed questionnaire (Day & Maurato, 2002). CVM is the best option for goods/services valuation when the simulated goods or services are similar to a marketed good or service. It is constructed based on the hypothetical markets in which the visitors give the hypothetical amount of their WTP for the non-marketed goods or services they consume. Specifically, visitors are asked to state their WTP (maximum or minimum amount) for particular goods/services, e.g., for the conservation of a natural park or a change in the quality of the environment (Belt & Cole, 2014).

The values directly reported by the respondents rely on the simulation conditions created by the researchers, the respondents' characteristics, and the questionnaire design and implementation (Arrow et al., 1993; Hanemann, 1994; Mitchell & Carson, 1989; Venkatachalam, 2004). In this study, WTP attempts to elicit the conservation value of marine resources by asking visitors the amount of money they are willing to pay in addition to the existing entrance fee. When the mean value of WTP for each individual is obtained in a CVM survey, the aggregated benefit (total amount) of the environmental conservation for the relevant population will be estimated by multiplying the mean WTP with the number of respondents visiting the MPA (Mitchell & Carson, 1989).

The estimated mean WTP in a CVM study of marine resources assumes the upper and lower bounds of the WTP integral. This means that the probability of the respondent answering "no" to the price amounts equals zero and the probability of answering "yes" equals one. If respondents are unwilling to pay for their unutilised benefit from the MPA, their negative WTP will be considered zero, which is the lower bound of WTP (Yacob et al., 2009).

The corresponding monetary measure in CVM is to employ WTP responses from questionnaires to value a particular environmental good or service from the respondents. Resource users are required to consider what they must trade off when deciding the WTP for offered good or service, and the alternative uses of that money. The WTP, in this case, is not only an attitudinal question but also more meaningful in an effective valuation measure. There is also a difference between theory and practice of resource users responding to the attitudinal WTP trade-off. Although respondents are concerned about environmental goods or services, they can afford only a part(s) of them in practice (Day & Maurato, 2002).

However, CVM has some methodological concerns as do other stated preference methods. First, the validity of the true value of environmental goods and services that CVM employs from the experiment. It combines content, criterion, and constructs validity. Content validity relates to the ability of the instruments in CVM to measure the true value by a hypothetical scenario. Criterion validity refers to the assessment from the "market price" of similar goods and services, which are used as criteria. Construct validity, on the other hand, is either convergent validity or theoretical validity, which aims to extract the corresponding measure of the same theoretical construct (convergent validity) or elicit the coincidence between the empirical results and the fundamentals of economic theory (Freeman, 1993; Venkatachalam, 2004).

The second concern is the reliability of CVM. It is associated with the consistency or repeatability measurement of estimates in the CVM survey. It is expressed through attribution of the variance of the WTP responses to the random disturbance, in terms of a reverse relationship between reliability and the degree of non-randomness (Turner, 1993). In another way, reliable methods result in similar measurements if nothing has changed in the true value of the commodity in reduplicated experiments. If the commodity true value changes, the method would change its measurements accordingly (Venkatachalam, 2004).

Lastly, CVM faces several biases originating from the nature of the method including the presence of a hypothetical market (such as a hypothetical bias or embedding effect), or the survey's administration (bidding vehicle bias, starting point bias, sample selection bias, yes-saying bias, non-response bias or information bias) (Asafu-Adjaye, 2005; Asafu-Adjaye & Tapsuwan, 2008; Mitchell & Carson, 1989). The questionnaire's design and administration should be organised to eliminate those biases. For example, to reduce embedding effects, the questionnaire should supply necessary information to respondents including a differentiation between their budget and their WTP for non-value commodities (such as a conservation programme), and remind respondents their WTP amount could be used only in one chosen area (for conservation purposes) but not for others (Goodman et al., 1998).

There are four conventional techniques to elicit the WTP from a CVM scenario: the bidding game, the payment card, the open-ended question, and the closed-ended question. The bidding game offers respondents (visitors) progressively higher bids until they reach the maximum WTP (Boyle, Bishop, & Welsh, 1985; Randall, Ives, & Eastman, 1974). The payment card accommodates a series of value in a card and requests each respondent to choose one value on the card (T. Cameron & Huppert, 1989; Mahieu, Riera & Giergiczny, 2012; Liu, Liu, Zhang, Qu & Yu, 2019;). The open-ended question technique requests respondents to state their maximum value of WTP (Jala & Nandagiri, 2015; Samdin, Abdul Aziz, Radam & Yacob, 2010). Lastly, the closed-ended question technique (or dichotomous choice) is considered more robust when eliciting the WTP (Bengochea-Morancho, Fuertes-Eugenio, & del Saz-Salazar, 2005; W. Y. Chen & Jim, 2012; Hall et al., 2002; Xu, Loomis, Zhang, & Hamamura, 2006). There are at least three levels in closed-ended questions: single-bounded dichotomous choice (take it or leave it), double-bounded referendum (where respondents will be asked a second round after answering the first round with a dichotomous choice), and trichotomous choice (where respondents will be asked for their WTP with three layers) (Asafu-Adjaye, 2005).

In formulating a predictive WTP model for MPA conservation, King (1995) identifies several independent variables, including demographic variables such as gender, age, income and other environmental and conservative perception variables. These independent variables have been shown in previous studies to influence the bids for WTP (Jeanty, Haab & Hitzhusen, 2007; Landry, Shonkwiler & Whitehead, 2018; Nam & Son, 2001; Thur, 2004). The WTP function for each visitor *i* is specified as follows:

$$\text{WTP}_i = f(\text{INC, FREQ, ENV, DEM...}) \qquad (3.20)$$

Or: $$\text{WTP}_i = \beta_0 + \beta_1 INC_i + \beta_2 FREQ_i + \beta_3 ENV_i + \beta_4 DEM_i + \cdots + \varepsilon_i \qquad (3.21)$$

Where: *INC* is the total household or individual annual income; *FREQ* is an average number of previous visits of respondent *i* to the site; *ENV* is an environmental quality of the site; *DEM* is a vector of demographic characteristics of respondent *i*, which may include *AGE* (the age of the respondent equals or above 18 years old), *GEN* (dummy variable, 1 = male, 0 otherwise), *EDU* (number of years in education or education level of respondent *i*), and *OCC* (occupation of respondent *i*); β_0 is the model coefficient; and $\beta_1, \beta_2, \beta_3, \beta_4, \ldots$ are coefficients for independent variables (the right-hand side of equation (3.21)).

Two CVM techniques (payment card and double-bounded dichotomous choice) will be used in this study to estimate the mean WTP for conservation from respondents visiting CLC MPA (by contributing more for the entrance fee), and to investigate the determinants affecting the respondents' WTP.

3.3.1 Payment Card

Mitchell and Carson (1989) used the payment card with the consideration it was a reliable vehicle for a contingent valuation survey. It eliminates the problem of starting bids, which may arise in a traditional bidding application. In some CVM techniques, the initial bid has its own problem related to the respondents' WTP and may have a consequence on the respondents' next bid (Geleto, 2011)

In the payment card technique, the problem of the initial bid is managed. A series of WTP values are introduced to respondents with the lowest bidding value zero. The WTP values then increase at fixed intervals until the threshold value is achieved. The respondents are asked to choose their WTP from one of the values. However, this technique also has disadvantages, including the anchoring bias of a series of bids presented on the payment card (Geleto, 2011). The anchoring bias indicates that the respondents' WTP opinion may be affected by the first price the respondents see.

Although the payment card is less attractive since it reveals a lower benefit estimate compared with the dichotomous technique, it has been used in studies because its conservative design results in a lower bound estimate of the respondents' true WTP (Goodman et al., 1998). Reaves, Kramer and Holmes (1999) show that a dichotomous choice has a lower response rate, higher non-response rate and a higher level of protest response, compared with the payment card format.

The payment card assumes that a series of WTP values will include the true WTP values that the respondents state for their WTP (Arin & Kramer, 2002). Based on the set of WTP values chosen by the respondents, the mean WTP will be calculated to determine the visitors' WTP for conservation in the MPA. Following Liu et al. (2019), the mean WTP is expressed in the following equation:

$$E(WTP) = \frac{1}{n}\sum_{t=1}^{n} B_t F_t \qquad (3.22)$$

Where: *E(WTP)* is the mean WTP of visitors, B_t is the bidding value in the payment card with a series of *t* values, *n* is the total number of visitors, and F_t is the number of visitors who state the bidding value B_t.

The WTP is hypothetically determined by other factors considered as explained variables. Both OLS and maximum likelihood estimates are used in payment card CVM studies to investigate the determinants of WTP by visitors (T. Cameron & Huppert, 1989; Ghosh & Mondal, 2013; Lindsey & Holmes, 2002). However, the OLS estimate confronts a problem from the WTP values on the payment card if those values are presented in intervals rather than in points. OLS will treat interval values at their interval midpoints giving a misleading result, an inequality between the expected values within the intervals and interval midpoints (T. Cameron & Huppert, 1989).

In maximum likelihood, binary logistic regression, logistic regression or multiple regression are used depending on the principle of the WTP question. If it is a binary choice question, then the binary logistic regression should be applied (Mathieu, Langford & Kenyon, 2003). Otherwise, multiple regression or multivariate analysis are preferred.

In the payment card format, WTP responses are treated as interval valuations rather than point valuations (T. Cameron & Huppert, 1989; Xu et al., 2006). It overcomes the problem of a true WTP value from the respondents by inferring that the respondents' WTP values are dropped within the interval values between the respondents' chosen value and the next highest value. This "midpoint method", which uses midpoints in the intervals as approximations of the true unobserved values, would create a bias on an average valuation or coefficients in OLS regression. However, maximum likelihood estimation has no bias problem with the interval valuation because of the dependent variable in the regression models is estimated only on intervals of a continuous scale (T. Cameron & Huppert, 1989).

The *lognormal* distribution function of WTP is proposed because the valuation distribution is regularly skewed to avoid negative values. If t_u and t_l are the upper and lower threshold values within the interval values, the WTP_i value of respondent *i* will be dropped between t_{ui} and t_{li}, then *log* (WTP_i) will be within the brackets of *log*(t_{ui}) and *log* (t_{li}). The WTP_i value for each respondent *i* will be estimated using the equation (3.23) (T. Cameron & Huppert, 1989):

$$Log(WTP_i) = x_i\beta + \mu_i \qquad (3.23)$$

Where: WTP_i is the true value of WTP of respondent i, x_i is the vector of respondent's characteristics or other explained variables, and μ_i is an error with a normal distribution with mean zero and standard deviation σ.

The probability of both sides of equation (3.23) is given as follows (T. Cameron and Huppert, 1989; Mahieu et al., 2012):

$$\Pr(\text{Log}(t_{li}) < \text{Log}(WTP_i) < \text{Log}(t_{ui})) = \Pr(\frac{\text{Log}t_{li} - x_i'\beta}{\sigma} < z_i < \frac{\text{Log}t_{ui} - x_i'\beta}{\sigma}) \qquad (3.24)$$

Where: z_i denotes the standard normal random variable. The probability in equation (3.24) is that the result of the relationship between two different standard normal cumulative density functions (G_{ui} and G_{li}) represent the lower and upper limits of WTP values, z_{li}, and z_{ui} respectively. The probability of WTP_i from respondent i will fall between these two threshold values (G_{ui} - G_{li}). Equation (3.24) can be rewritten as follows:

$$\Pr(\text{Log}(t_{li}) < \text{Log}(WTP_i) < \text{Log}(t_{ui})) = \text{G}(z_{ui}) - \text{G}(z_{li}) \qquad (3.25)$$

The corresponding log-likelihood function with n respondents is interpreted in equation (3.26):

$$\text{Log}\, L = \sum_{i=1}^{n} \text{Log}[\text{G}(z_{ui}) - \text{G}(z_{li})] \qquad (3.26)$$

The fitted value of Log (WTP_i) can be obtained when the optimal values of β and σ are estimated. The parameter $x_i'\beta$ refers to the conditional mean of Log (WTP_i) for any given vector of x variable. Based on this, the conditional distribution of WTP is retransformed; its median and mean are estimated as $exp(x_i'\beta)$ and $exp(x_i'\beta + \sigma^2/2)$, respectively. However, the median WTP is preferred, rather than the mean value, because the median value can be considered as a weighty unit for unobserved WTP central convergence and is less sensitive to the standard deviation of the random variable σ (T. Cameron & Huppert, 1989; Xu et al., 2006).

3.3.2 A Double-bounded Dichotomous Referendum

Since the payment card format may have an anchoring bias, the double-bounded dichotomous referendum or double-bounded dichotomous choice (DBDC) is used to overcome this bias. However, most CVM instruments have their own drawbacks. The DBDC may have an information bias relating to the valuation process resulting in consequences of biased reflection of the respondents' true WTP. The valuation process depends on the information (goods/services) given to the respondents, the survey approach, or the interviewers (Geleto, 2011). Moreover, there are other biases that may arise when employing DBDC, including hypothetical bias (because of over-estimation from the hypothetical market), starting bid bias, and other effects (shift or framing effects). All those biases should be detected in CVM-DBDC studies by including verified questions in the survey to ensure the respondents participating in the survey are trustworthy, reliable participants (Asafu-Adjaye & Tapsuwan, 2008; Piriyapada & Wang, 2015).

Because of its advantages, DBDC has been widely used. DBDC is considered an efficient statistical vehicle to estimate the hypothetical price of environmental goods and services. Besides, the "take-it-or-leave-it" scenario in this technique makes it more like common market transactions to consumers (Asafu-Adjaye & Tapsuwan, 2008). DBDC asks the respondents to engage in two steps of bidding. Initially, respondents are asked to accept or not accept the first bid and are offered a second question. The first bidding question is described as follows.

*"If the authority wanted to conserve and preserve biodiversity in the CLC MPA, and increase the charge to $**X** per person, would you be willing to pay to visit this MPA?"*

According to Hanemann, Loomis and Kanninen (1991), the follow-up question depends on the respondents' first bid. If they say "yes" for the first bid amount, the bid amount in the follow-up question will be higher (e.g., double or triple the bid amount in the initial question). In this study, the amount $**2X** will be offered. If the respondent says "no" to the first bid question, the follow-up question will have the lower amount, for instance half price compared with the first bid in this study, $½**X**.

For each respondent *i*, let B_i denote the first bid, B_i^U is the higher amount of the second bid if he/she responds "yes" to the first bid ($B_i^U > B_i$), and B_i^L is the lower amount of the second bid if he/she responds "no" to the first bid ($B_i^L < B_i$). Hence, the DBDC will have four possible bidding answers from the respondents and the binary-valued indicator variables for those responses are given as:

d_i^{YY} = Yes-Yes (when the respondent answers "yes" for both bidding questions),

d_i^{NN}= No-No (when the respondent answers "no" for both bidding questions),

d_i^{YN} = Yes-No (when the respondent answers "yes" followed by "no" in bidding questions), or

d_i^{NY} = No-Yes (when the respondent answers "no" followed by "yes" in bidding questions).

The indicator variables d_i^{YY},d_i^{NN},d_i^{YN} ,d_i^{NY} will equal one if the statement is true and zero otherwise (Yoo & Yang, 2001).

According to Hanemann et al. (1991), assuming the respondents would like to maximize their utility, the likelihood of the above responses are π^{YY}, π^{NN}, π^{YN}, and π^{NY}, respectively:

$$\pi^{YY}(B_i, B_i^U) = Pr\{B_i \leq Max\ WTP \text{ and } B_i^U \leq Max\ WTP\} \quad (3.27)$$

$$= Pr\{B_i \leq Max\ WTP | B_i^U \leq Max\ WTP\}\, Pr\{B_i^U \leq Max\ WTP\}$$

$= Pr\{B_i^U \leq Max\ WTP\}$

$= 1 - G(B_i^U; \theta)$

because $B_i^U > B_i$, $Pr\{B_i \leq Max\ WTP | B_i^U \leq Max\ WTP\} = 1$. Similarly, $Pr\{B_i^L \leq Max\ WTP | B_i \leq Max\ WTP\} = 1$ when $B_i^L < B_i$. The likelihood formula in case of "no-no" response is given as follows:

$$\pi^{NN}(B_i, B_i^L) = Pr\{B_i > Max\ WTP \text{ and } B_i^L > Max\ WTP\} \quad (3.28)$$

$$= G(B_i^L; \theta)$$

In a "yes-no" response, we have $B_i^U > B_i$; the likelihood formula given as follows:

$$\pi^{YN}(B_i, B_i^U) = Pr\{B_i \leq Max\ WTP \leq B_i^U\} \quad (3.29)$$

$$= G(B_i^U; \theta) - G(B_i; \theta)$$

In a "no-yes" response, we have $B_i^L < B_i$; the likelihood formula given as follows:

$$\pi^{NY}(B_i, B_i^L) = Pr\{B_i \geq Max\ WTP \geq B_i^L\} \quad (3.30)$$

$$= G(B_i; \theta) - G(B_i^L; \theta)$$

If B_i, B_i^U and B_i^L are used as initial bids and follow-up bids applied to *N* respondents, then the log-likelihood function is constructed as follows:

$$LnL = \sum_{i=1}^{N} \left\{ \begin{array}{c} d_i^{YY}\, ln[1 - G(B_i^U, \theta)] + d_i^{NN}\, ln[G(B_i^L, \theta)] \\ + d_i^{YN}\, ln[G(B_i^U, \theta) - G(B_i, \theta)] + d_i^{NY}\, \ln[G(B_i, \theta) - G(B_i^L, \theta)] \end{array} \right\} \quad (3.31)$$

Where *G* is presented by the cumulative logistic function as follows:

$$G(B, \theta) = \frac{e^{\theta}}{1 + e^{\theta}} \quad (3.32)$$

3.4 Chapter Summary

This chapter introduces the valuation methods used to estimate the economic value of the CLC MPA, the Travel Cost and Contingent Valuation Methods. Both individual and zonal techniques from TCM are used to value the benefits of recreation. The individual method is based on the number of visits that each respondent makes to the site over a certain period. The zonal method relies on the ratio of the number of visits from each geographical zone to the CLC MPA and the population of that zone as the dependent variable of the model.

CVM is used to estimate the benefits from the conservation of biodiversity in the CLC MPA. The payment card and DBDC will be used to elicit respondents' WTP for conservation and the determinants affecting their WTP. The payment card offers a series of bids to respondents to place their WTP for conservation. The DBDC elicits the respondents' WTP by offering them two levels of bidding in binary responses. The offer amount in the second level depends on the respondents' response at the first level. If respondents say "yes" to the first round, a double value of the first bid is offered in the second round. A halved value of the first bid is offered if the respondents say "no" to the first round.

The next chapter discusses the survey's administration using TCM and CVM in a structured questionnaire to elicit respondents' travel costs and WTP for the conservation of CLC MPA. The results of the respondents' descriptive profile are also presented in the next chapter.

Chapter 4

Data Collection and Respondents Profiles

4.1 Introduction

This study uses both primary and secondary data. Data collected from the survey are used to investigate respondents' socio-economic characteristics, their benefits from using recreation areas, their perceptions of conservation and environmental protection in the CLC MPA, and their contribution to conserve marine resources by paying an additional entrance fee when visiting the CLC MPA. This chapter is structured as follows: Section 4.2 describes the two stages of primary data collection: the survey design and onsite data collection. Section 4.3 provides information about the secondary data collected from The General Statistics Office of Vietnam and other data sources. Section 4.4 discusses respondents' demographic characteristics, their tourism activities and their environmental awareness. Section 4.5 summarises the chapter's findings.

4.2 Primary Data Collection

4.2.1 Survey Design

This study collected primary data from visitors to determine their total travel costs and their WTP to contribute to the CLC MPA conservation programme. There was a mix of domestic and international visitors involved in the survey. In this study, we investigate the factors that affect visitors' WTP for conservation as well as their travel decisions to visit CLC MPA.

The study used a structured questionnaire to gain information about respondents' travel expenses (travel costs from home to the CLC MPA, onsite and off-site expenses during their trips) and their stay (length of stay, recreational activities and accommodation). Respondents were also asked to provide information about their views on environmental protection and conservation in MPAs in general, their WTP for CLC MPA preservation, and demographic data. Respondents' travel expense data are used to calculate their CS to estimate the CLC MPA's recreational benefits.

The questionnaire was written in English and translated into Vietnamese. The English version was offered to foreign visitors who could read and write in English. The Vietnamese version was used for Vietnamese visitors. Visitors who could not speak English or Vietnamese (these individuals were mainly from China, Korea or Japan), were excluded from the survey, because we did not have research assistants who were able to translate the questionnaire into other languages or organise separate interviews. Some statements from the Vietnamese questionnaires were translated into English during data input for further assessment and analysis.

The questionnaire consisted of 47 questions with a variety of answer formats: yes/no questions, multiple-choice questions, Likert scale questions, and open-ended questions. It was divided into three sections and had an explanatory cover letter (see Appendix A). The cover letter introduced the purpose of the study, which was to provide visitors with information about the importance of conserving the CLC MPA (CLC MPA) through sustainable development and integrated coastal management. Another aim was to investigate visitors' thoughts on the conservation and biodiversity of marine and coastal resources in the CLC MPA. The cover letter included all the necessary information about the study. It also contained the researcher's contact details, age requirements and explained the consent process and the fact that participation was voluntary.

The ***first part*** of the questionnaire asked the respondents to provide general information about their travel motivations, travel-related costs, onsite activities, and their evaluation of the CLC MPA. This part was designed to reveal respondents' total trip costs, thus included questions about travel expenses and the time opportunity cost (time spent on travel and onsite). The travel cost questions asked about the respondents' transport means, the cost of respondents' fares, and other expenses. Zeybrandt and Barnes (2001) suggest that questions related to respondents' trip costs should be organised in the following way: the questionnaire should begin with general travel costs, followed by specific costs (e.g., fishing costs) so that the respondents do not misunderstand the questions. The respondents were also asked how many times they had travelled to the CLC MPA in the previous five years, other destinations that they had visited or planned to visit during the current trip, and the number of people within their group. Five-point Likert scale questions were used to elicit respondents' attitudes to eco-tourism and their journey(s) purpose(s). For instance, the respondents were asked to indicate how they felt about eco-holidays using five-point Likert scales (1 – 5): "less important", "slightly important", "neutral", "important", and "most important".

The ***second part*** of the questionnaire included questions related to respondents' perceptions and awareness of conservation. It began by asking respondents to indicate their degree of satisfaction with the MPA's recreation area and marine resources. It also asked them to evaluate the quality of the CLC MPA, and for their opinion of the most important CLC MPA value(s). This part also included questions designed to elicit the respondents' WTP for an additional entrance fee to contribute to the CLC MPA conservation programme. These questions used the CVM payment card and DBDC format. The respondents were asked to indicate the reason(s) why they were (un)willing to pay for conservation in the CLC MPA.

In the payment card format, 10 additional user fees (on top of current entrance fee) were proposed: US$1, US$1.5, US$2, US$2.5, US$3, US$3.5, US$4, US$4.5, US$5, and over US$5 (VND 22,500; 34,000; 45,000; 56,000; 67,500; 79,000; 90,000; 101,500; 112,500; and over 112,500). This bidding question was included after questions about the current entrance fee to minimise an anchoring bias. If the respondents' WTP was affirmative, their maximum WTP would be higher or equal to the chosen bid. Respondents were also asked to provide a reason for their WTP. Those were unwilling to pay an additional entrance fee were asked to indicate why. They were provided with a list of reasons. The survey also provided space for the respondents to write (an) additional reason(s) that was not included in the list. In short, the respondents not willing to pay an additional amount could provide as many reasons for their decision as they wanted.

The last three questions in Part Two were designed to determine the amount the respondents were willing to pay, using the DBDC format. These questions are to test if measures by the payment card and the DBDC differ from the WTP estimate and to determine factors affecting visitors' WTP for conservation in the CLC MPA. If a visitor answered "yes" to the first offer of $**X** for conservation, the $**2X** was offered in the follow-up question. If the visitor answered "no" to the question, a $**1/2X** amount was offered. The lowest positive offer was VND 20,000 (US$1.24) and the highest offer was VND 112,000 (US$4.97).

The ***last part*** of the questionnaire included questions about respondents' demographic characteristics, including their home, education, gender, household income, the number of household members, the number of income earners, age group, marital status, and occupation.

4.2.2 Locations and Survey Administration

The survey was administered from 28 February until 12 May 2018. Data collection was interrupted several times during this period because of tropical storms, or strong winds and rough seas, which made it impossible for visitors to travel to the island; boats did not operate in these conditions.

Some interviewed respondents were on one-day trips, others were on multiple day trips. They included both domestic and international visitors. Bearing in mind that beaches and marine resources (e.g., coral reefs) are the essential elements to attract visitors to the CLC MPA, very few visitor activities occur in CLC MPA from October until February because this is the storm period. The high season for tourism in the CLC MPA starts from the April-May public holidays (Reunification Day/Labour Day) until the end of September. Ngoc (2018) notes that approximately 3,000 people visit the CLC MPA per day over many days in the high season. Visitors have experienced increased travelling costs and expenses in the CLC MPA because of shortages in visitor services (such as accommodation, transport, and recreational activities). The increased number of visitors has also led to a greater environmental impact (more rubbish and degradation of the environment like unclean beaches and water). At Khanal's (2011) suggestion, we chose not to conduct our survey during the high peak season to avoid problems associated with information bias and inflated research data.

Martínez-Espiñeira and Amoako-Tuffour (2008), Nuva, Shamsudin, Radam, and Shuib (2009), and Thur (2010) suggest that the sampling population for the interviews should be made in a convenient manner and non-probability with an onsite face-to-face interview. This sampling method is the most appropriate way to access a population sample when a researcher has a limited amount of time and resources (e.g., a limited number of research assistants) (Arin & Kramer, 2002). Arrow et al. (1993) and King (1995) suggest that interviews should be conducted in person because this approach allows the researcher the opportunity to ask additional questions where responses are unclear.

On average, a questionnaire interview took 25 to 35 minutes to complete. Following Arin and Kramer (2002), the questionnaire was administered using a variety of methods: in-person, self-administered or both, depending on the context of interview and the respondents' need for further explanation of questions. Respondents on a one-day trip had limited time to enjoy the CLC MPA and, thus, not surprisingly were reluctant to participate. Respondents were provided with information about the study's purpose and how their data would be used. They were also assured of the confidentiality of their responses.

The questionnaire was administered at the main beaches on Hon Lao Island. This island is the biggest of the eight islands in the CLC MPA and is the only inhabited one. Visitors to this island can stay and enjoy recreational activities there. The beaches include:

- Bai Ong, the west-north beach, the departure dock for speedboats going back to the mainland. It is the most crowded beach on Hon Lao.
- Bai Lang, the west and central beach. It serves as Hon Lao's main arrival port for speedboats and is the arrival and departure point for the ferry.
- Bai Chong, the west and central beach, is where diving agency boats arrive and depart. The marine area around this beach is considered to have the most beautiful scenery and the most diverse coral reef in the CLC MPA.
- Bai Huong, on the south-west shore of Hon Lao Island where speedboats arrive and depart. A combination of diving and recreational activities take place here. There are also some dead coral reefs at the southern end of this beach, but they are approximately 300 m to 500 m from the main Bai Huong beach.

Two students from Da Nang University of Education and two freelance tour guides served as interviewers (research assistants). One tour guide was bilingual. Including me, two interviewers were able to interview English-speaking respondents. Interviewers were trained in how to approach respondents, to introduce the research purpose and provide a brief introduction about the CLC MPA. They also explained how to complete the questionnaire correctly. Target respondents were visitors and divers (Vietnamese and foreigners). Interviewers approached respondents who were resting on the beach before returning to the mainland and asked them to complete the questionnaire. The interviewers also approached respondents staying in the CLC MPA longer than one day, at cafés, restaurants and shops. The interviewers clarified and explained the questions in the questionnaire to the respondents when doubts arose about questions.

Most one-day trip visitors stayed on the island between 8.30 a.m. and 3.00 p.m. Overnight visitors visited the island during the morning and usually left the island the following the morning/afternoon. Interviews were conducted between 7.00 a.m. and 2.30 p.m. and between 5.00 p.m. and 7.00 p.m. No interviews were conducted on rainy or stormy days. Respondents were interviewed after they had completed diving or recreational activities (such as exploring the island) and finished their other activities, such as parasailing.

As suggested by Cochran (1977), at the 95% confidence level, the current study needed to administer a minimum of 500 face-to-face interviews with a 20% contingency of the total sample size built in. According to Ward and Beal (2000), the total number of completed questionnaires required for TCM is between 300 and 500. If the response rate is low, then the sample size should be larger, the collection of more questionnaires would be required. For example, if the response rate is approximately 20%, then 2500 questionnaires should be administered to get 500 completed questionnaires. Mitchell and Carson (1989) recommend a sample size of between 200 and 2500 for CVM.

A total of 556 questionnaires were administered for the study. We obtained 505 completed responses and 51 incomplete responses (because of time limits), which equates to a response rate of 90.8%. Only completed questionnaires were included in the econometric analysis for the travel cost estimates and WTP analysis.

4.3 Secondary Data

Secondary data required for the TCM estimate (for both individual and zonal TCM) and the WTP models were obtained from the General Statistics Office of Vietnam. Other regulations and official technical reports were sourced from the Ministry of Transport of Vietnam. Secondary data included:

- The total number of visitors who visited the CLC MPA between 2005 and 2018. These reports and studies were used to estimate the CLC MPA benefits from tourism and conservation.
- The 2016 average individual income from 40 Vietnam provinces. This was sourced from the General Statistics Office of Vietnam and was used to estimate visitors' opportunity costs and visitors' total travel costs.
- Airfares, bus fares, fuel consumption rate, and distances between provinces in Vietnam were obtained from the Ministry of Transport regulations, circulars and technical reports. These data were used to estimate visitors' aggregated travel costs.
- Other statistical data, such as population figures, were collected from the General Statistics Office of Vietnam and the World Population Review.

4.4 Descriptive Statistics

4.4.1 Respondents' Socio-demographic Characteristics

Table 4.1 reports the socio-economic characteristics of the surveyed respondents. This island seems to be more attractive to young people in the predominant age groups of 26 – 35 years and 18 – 25 years (40% and 26.93% of total observations, respectively). The results show that 86.93% of the respondents were 45 years and under. Over a third of respondents had a bachelor degree (36.63%) and over another quarter had a college diploma/certificate (28.71%). Unsurprisingly, the dominant occupation category was professionals (35.25%) followed by managers/business owners (24.95%). Least respondents were unemployed or homemaker (only accounted for 1.39%). The results also show that over 55% of the respondents were married, followed by 36.63% who were single or have never been married. Women were more likely to visit the CLC MPA than men (54% and 46%, respectively).

Table 4.1 shows that students were attracted to visiting the CLC MPA. They represent 14.06% of the total sample. However, most of them on day trips. Approximately 62% of domestic students and over 65% of international students spent one day in the CLC MPA. The number of domestic students who spent two days and the number of international students who spent three days on the island were similar (31.03% and 38.46%, respectively).

There is a slight difference between domestic and international respondents in terms of demographic characteristics. However, there was a significant difference in their previous visits to CLC MPA, their group size and their household income (see Table 4.2). For international respondents who visited the CLC MPA in the last five years, no one has visited the CLC MPA once or twice in the past (see Table 4.2). Only two respondents (2.6% of the total foreign respondents) have visited the CLC MPA more than twice. Most of the foreign respondents were visiting the CLC MPA for the first time (97.4%). The number of domestic respondents who were returning was 27.16%. Not all returning respondents are locals, because non-locals re-visiting the CLC MPA accounted for 42.06%. As many as 76.63% of total respondents were visiting the CLC MPA for the first time. Only 4.75% of the all respondents had visited the CLC MPA three times or more in the past five years.

Table 4.1 The descriptive statistics of the surveyed respondents

		Frequency (n=505)	Percentage	Cumulative percentage
Age group (Years old)	18 - 25	136	26.93	26.93
	26 - 35	202	40.00	66.93
	36 – 45	101	20.00	86.93
	46 – 55	48	9.50	96.44
	56 – 65	16	3.17	99.60
	Over 65	2	0.40	100.00
Education level	No formal education	8	1.58	1.58
	Primary school	1	0.20	1.78
	Secondary school	23	4.55	6.34
	High school	98	19.41	25.74
	Three-year or under college diploma/certificate	145	28.71	54.46
	Bachelor degree	185	36.63	91.09
	Post graduate degree (Postgraduate diploma/master/doctor of philosophy)	45	8.91	100.00
Occupation	Civil servant	75	14.85	14.85
	Manager/owner of business/self-employed	126	24.95	39.80
	Staff and profession (lawyer, scientist, engineer, teacher, doctor, etc.,)	178	35.25	75.05
	Student	71	14.06	89.11
	Fisherman/farmer	27	5.35	94.46
	Retired	12	2.38	96.83
	Unemployed/homemaker	7	1.39	98.22
	Other	9	1.78	100.00
Marriage status	Single/never married	185	36.63	36.63
	Engaged	24	4.75	41.39
	Married	278	55.05	96.44
	De facto relationship	13	2.57	99.01
	Divorced/separated	3	0.59	99.60
	Widow/widower	2	0.40	100.00
Gender (n=504)	Female	272	54.0	54
	Male	232	46.0	100.00

Table 4.2 indicates that most respondents travelled in groups of five or fewer people (67.93%, 63.7% and 88.46% for combined, Vietnamese and foreign respondents, respectively). The number of people who visited the CLC MPA in groups were from one to 70 persons with a mean of seven. The group size distribution varied for domestic and international respondents (see Table 4.2). The largest number of Vietnamese respondents travelled in groups of three to five members (36.07%). Groups of two persons predominated foreign respondents (39.74%).

Table 4.2 Differences between domestic and international respondents

Factor	Category	Frequency			Percentage (%)		
		(1)**	(2)**	(3)**	(1)**	(2)**	(3)**
Number of visits	0	387	311	76	76.63	72.84	97.44
	1	60	60	-	11.88	14.05	-
	2	34	34	-	6.73	7.96	-
	≥ 3	24	22	2	4.75	5.15	2.56
Group size (number of people)	1	18	7	11	3.59	1.64	14.10
	2	142	111	31	28.29	26.0	39.74
	3 – 5	181	154	27	36.06	36.07	34.62
	6 – 15	111	102	9	22.11	24.36	11.54
	> 15	53	53		9.95	11.94	
Monthly gross income (million VND)	< 5		3			0.70	
	5 – 10		17			3.98	
	10 – 15		109			25.53	
Vietnamese respondents	15 – 20		125			29.27	
	20 – 25		73			17.10	
	> 25		100			23.42	
Foreign respondents* (n=77)	< 45			13			16.88
	45 – 90			27			35.06
	90 – 135			12			15.58
	135 – 180			7			9.09
	180 – 225			8			10.39
	> 225			10			12.99
Total number of observations		505	427	78	100	100	100

* *The income values of foreign respondents were converted from USD into VND.*
** *(1), (2), and (3) were combined, Vietnamese, and international respondents, respectively.*

Unsurprisingly, the study found that international respondents have higher gross monthly household income than the Vietnamese respondents (see Table 4.2). Approximately 76.58% of Vietnamese have household incomes below VND25 million per month (approximately US$1,100/month). In contrast, international respondents (83.12%) have gross household incomes above VND45 million per month (US$2,000/month).

Table 4.3 shows that most respondents visited the CLC MPA for a vacation (93.3%). Ninety-one respondents (18%) indicated that their trip was related to recreation and sport. Only a few respondents travelled to the CLC MPA for health or cultural reasons (1.2%). No respondents travelled to the CLC

MPA for religious purposes. Other reasons provided by the respondents for visiting the CLC MPA included working remotely, finding a quiet place to snorkel/swim or observe the monkeys in nature (nature seekers). Most respondents had a single reason for visiting the CLC MPA (e.g., vacation only or work only). Some had more than one objective for travelling to the CLC MPA (such as combining a vacation with visiting relatives).

Table 4.3 Respondents' purpose for visiting the CLC MPA

Purpose	Selection	Percentage
Vacation/holiday	471	93.3
Visiting relatives and/or friends	10	2.0
Business reasons	24	4.8
Culture	14	2.8
Study/research or education	18	3.6
Sports and recreation	91	18.0
Health	6	1.2
Religious reasons	0	0
Other	4	0.8
Total number of observations	505	

As Table 4.4 indicates, respondents' motivations for visiting the CLC MPA varied. The motivation questions used a five-point Likert scale ranging from 1 to 5, where 1 indicated "not at all important", and 5 indicated "most important." Respondents scored tourism in nature (or eco-tourism) and clean beach experience the highest (a mean of 4) in trip motivations. The results revealed that respondents were less interested in seeing local plants and wildlife at the CLC MPA; the average score for this category was 2.86. The results show that "the trip to CLC MPA was included in the tour" was not a key motivator (a mean of 2.6). It means that respondents who visited the CLC MPA in a tour group, chose to visit the CLC MPA rather than another destination. Some respondents did not score all the motivations listed in the questionnaire; others chose one or several of them, indicating that they had multiple motivations for visiting the CLC MPA.

Table 4.4 Respondents' motivations for visiting the CLC MPA

Motivation	Obs.*	Mean	S.D.**	Min	Max
Experiencing natural tourism	487	4.00	0.90	1	5
Enjoying underwater sport activities	484	3.42	1.22	1	5
Learning about local plants and wildlife	483	2.86	1.19	1	5
Being close to nature in a unique place	489	3.73	1.02	1	5
The trip included in the tour	481	2.60	1.29	1	5
Enjoying clean beaches and sun	482	4.07	0.95	1	5
Total number of observations		550			

**Obs.: observation. **S.D.: standard deviation*

Most respondents found information about CLC tourism on the internet (319 observations, 63.17% of all respondents). Over half of the respondents obtained information from their friends and family

(51.63%), and a hundred respondents (19.8%) were given information about the CLC MPA from a travel agency. Only 1.19% of respondents learned about the CLC MPA from a visitor fair.

The results in Table 4.5 show that 53.27% of the respondents travelled by plane and bus to the CLC MPA. Just over 18% of the respondents travelled to the CLC MPA using a motorbike; most were local residents. Very few respondents travelled to the CLC MPA by train (only 0.79%), perhaps because this form of transport is not as convenient as the alternatives. Domestic respondents came from 40 different provinces, from the north to the south of Vietnam. More respondents came from the north and central parts (84.9%) than from the south (15.01%). International respondents came from Asia (Japan, Hong Kong, Singapore and Thailand), North America, Oceania, South Africa and 11 European countries. Some foreign respondents indicated that they were now based in Vietnam; they lived and worked there. These respondents were considered international respondents because of differences in their education, income, and other demographic characteristics from Vietnamese respondents.

Table 4.5 Respondents' means of transport to the CLC MPA

	Frequency (n=505)	Percentage	Cumulative percentage
Flight and travel bus	269	53.27	53.27
Travel bus/rented bus	132	26.14	79.41
Motorbike	94	18.61	98.02
Train	4	0.79	98.81
Other (mixed means of transport)	6	1.19	100.00

Most respondents spent one day in the CLC MPA (63.56%). The remainder spent anywhere between two and 15 days at the site. The number of Vietnamese and foreign respondents on a one-day trip was little different, 64.5% and 61.5%, respectively. However, there was a significant difference between the number of domestic and international respondents who stayed in the CLC MPA for more than one day. The results show that 32.1% of Vietnamese respondents spent two days in CLC MPA compared with 16.7% of international respondents. However, only 2.6% Vietnamese spent three days in the CLC MPA compared with 16.7% of international respondents.

In terms of accommodation, respondents who spent more than one day in the CLC MPA were more likely to stay in a homestay (81.52%). This is because there are limited accommodation options for respondents who want to stay overnight. Other than homestays, respondents can stay only at a camping ground. International respondents prefer staying in a homestay because they can experience the local lifestyle. Respondents stayed in the CLC MPA for an average of 1.5 days and spent on average, 5 hours outside in nature (see Table 4.6). Most respondents spent between 0-4 hours (41.19%) or 4-8 hours (42.77%) in nature. The statistics show that international respondents spent more time in the natural environment than domestic respondents (5.95 hours compared to 4.88 hours, respectively) (see Table 4.6).

Table 4.6 Respondents' time in the CLC MPA

Respondents' time in CLC MPA and in nature		Mean	S.D.	Min	Max
Time in CLC MPA (days)	Combined	1.49	1.13	1	15
	Vietnamese	1.41	0.71	1	10
	Foreigner	1.95	2.31	1	15
Time in nature (hours)*	Combined	5.04	3.32	0	14
	Vietnamese	4.88	3.20	0	14
	Foreigner	5.95	3.83	0	14
Total observations		505			

* *Respondents were given a range of times for time in nature: 0, 0 – 4 hours; 4 – 8 hours; 8 – 12 hours; and more than 12 hours. The midpoint of the ranges was used to calculate the mean values.*

Error! Not a valid bookmark self-reference. shows that there are four activities that respondents enjoyed the most: swimming (88.1%), relaxation with food and fresh air by the seashore (77.8%), snorkelling (65.7%), and marine and coral reefs sight-seeing (65.5%). Over half of the total number of respondents chose to visit local fishing villages (55.2%). This result was not surprising given that this activity is included in the one-day trip tour. All visitors in the tour groups visited the local villages immediately after their arrival on the island.

Table 4.7 Respondents' activities in the CLC MPA

Activities	Selection	Percentage (%)
Coastal excursion and swimming	445	88.1
Enjoy fresh and delicious seafood lunch by the seaside	393	77.8
Snorkelling and swimming in the seawater	332	65.7
Seeing spectacular sights of rare marine life and coral reefs	331	65.5
Visit local fishing villages in CLC MPA	279	55.2
Scuba-diving	92	18.2
Sea trekking	27	5.3
Other (fishing, parasailing, camping…)	54	10.7
Total number of observations	505	

Other sports activities (diving, sea trekking or fishing) were less attractive to respondents (fewer than 20% participated in these activities). The cost to participate in diving may be a barrier for some respondents because it costs a minimum of 850,000 VND per person (nearly US$40) for a dive. For some respondents, this price is even more than total costs for a one-day trip to the CLC MPA. Moreover, to participate in diving activities, respondents must be physically fit and adventurous.

In terms of the CLC MPA's characteristics, respondents' preferences were evaluated using a five-point Likert scales from 1 to 5, where 1 indicates "dislike" and 5 indicated "like". Respondents were asked to evaluate natural landscapes, social and cultural sites, areas for recreational activities, and visitor facilities. The mean values of those activities were calculated from the responses of respondents who participated in those activities. Generally, respondents enjoyed their experiences in the CLC MPA (see Table 4.8); all mean values are above 3 (above the midpoint). Respondents were assumed not to have engaged in a particular activity if they chose zero or left the answer empty. Respondents liked the beaches/sunbathing, swimming and underwater sports activities, and local cuisine (seafood) the most (means of 4.6, 4.3 and 4.3 points, respectively). Although fewer than half of the respondents went on seabed and boat excursions (48.12%), those who did enjoyed the experience as indicated by the mean of 4.12. Table 4.8 shows that respondents' least favourite activity was shopping at souvenir shops and their experience of tourism accommodation/facilities (means of 3.73 and 3.75, respectively).

Table 4.8 Respondents' preferences for recreation and tourism activities in the CLC MPA

	Obs.	Mean	S.D.	Min	Max
Beaches and sunbathing	491	4.60	0.66	1	5
Viewing seabed and/or boat excursion	243	4.12	0.94	1	5
Swimming and underwater sport activities	453	4.32	0.84	1	5
Local culture and religious areas experience	424	3.85	0.91	1	5
Local cuisine and seafood	483	4.32	0.84	1	5
Marine museum tour	398	3.86	0.99	1	5
Visitor accommodation and facilities	408	3.75	0.94	1	5
Souvenirs and local crafts	431	3.73	0.97	1	5
Total number of observations		505			

4.4.2 Eco-Tourism and Environmental Perception

As this study aims to elicit the CLC MPA's value by calculating respondents' travel costs and their WTP for marine conservation, it is important to understand respondents' experiences of eco-tourism and recreational activities, and their perceptions of the marine environment. All factors affecting their WTP for conservation, as well as their travel costs, can then be determined. Questions related to respondents' perceptions of the environment, conservation or eco-tourism were examined using a five-point Likert scale ranging from 1 to 5, where 1 indicates "strongly disagree/unsatisfied/very poor" and 5 indicates "strongly agree/very satisfied/very good."

Respondents' understanding of sustainable tourism and eco-tourism was investigated using a series of questions. Respondents were provided with a list of statements relating to their perceptions of the marine environment, natural resources and the relationship between development/tourism and conservation. The results in Table 4.9 show that 46.31% of the respondents stated that they did not understand the "sustainable tourism" concept or they scored 2 points and below ("disagree") for the first statement in the table. Meanwhile, 26.53% of the respondents agreed, and 15.37% strongly agreed with the statement: "I understand the concept of sustainable development." Over 43% of the respondents strongly agreed that well-managed attractions (such as the CLC MPA) are important for tourism management. Similarly, many respondents also strongly agreed that the community would benefit from the development of sustainable tourism (40.85%). Remarkably, only a few respondents strongly disagreed with these two statements (less than 2% of respondents). Generally, the mean values of the respondents' perceptions of sustainable tourism statements (Table 4.9) are 4 or above, except for the first two statements. These results indicate that most respondents have a relatively good understanding of the relationship between sustainable tourism and development, the environment, and society.

Table 4.9 Respondents' perceptions of sustainable tourism

Statement	Obs.	Percentage on scoring					Mean	S.D.
		1	2	3	4	5		
I understand the concept of sustainable tourism	475	13.05	33.26	26.53	11.79	15.37	2.83	1.25
I believe natural resource protection and tourism can be compatible	487	1.44	3.08	37.37	29.57	28.54	3.81	0.94
I believe that well-managed attractions, maintained in their natural state, are important for tourism management	494	0.81	1.62	25.51	28.74	43.32	4.12	0.9
I believe the community would benefit from developing a sustainable tourism framework	492	1.42	2.64	26.42	28.66	40.85	4.05	0.95
I believe there is a demand for sustainable tourism in and around the CLC MPA	492	1.02	3.25	26.22	30.89	38.62	4.03	0.93
I believe sustainable tourism may help to improve visitors' awareness of environmental protection in the CLC MPA	492	1.02	3.05	24.19	34.76	36.99	4.04	0.91
I believe that sustainable tourism may have an influence on improving the community's environmental protection programme	492	1.83	2.44	25.41	34.96	35.37	4.00	0.93
Total number of observations				505				

The goal of eco-tourism is environmental sustainability (Ahmed et al., 2005; Fennell, 2003). Eco-tourism helps to harmonise tourism development with environmental protection and natural resource conservation. Eco-tourism is about supporting visitor development that has a low impact on nature, is not based on excessive consumption, and benefiting locals (Fennell, 2003). Current visitor practices cause damage to the natural environment. For example, greater amounts of plastic rubbish left on the beach because of increased visitor numbers harms marine animals like tortoises and whales, or marine habitats, such as coral reefs (Asafu-Adjaye & Tapsuwan, 2008). Table 4.10 shows respondents' reasons for engaging in eco-tourism, where 1 indicates "less important" and 5 indicates "most important." Approximately two-thirds of respondents scored 4 and above for the reasons that they searched for the eco-holiday listed in Table 4.10. Average mean values ranged from 3.68 to 4.43. The "enjoying clean environment" statement exhibited the highest mean value of 4.43; over 57% of the respondents strongly agreed that this was the reason for seeking eco-tourism. "Experiencing remote and unspoiled nature" received the second highest mean value (3.95). Over 63% of the respondents scored this reason 4 points and above. The mean value for “learning about nature or creatures” had the lowest mean value at 3.68 (see Table 4.10).

Table 4.10 Respondents’ reasons for an eco-holiday

		Percentage on scoring						
	Obs.	1	2	3	4	5	**Mean**	**S.D.**
Visiting un-crowded destinations	499	4.41	2.20	26.05	45.49	21.84	3.78	0.94
Experiencing remote and unspoiled nature	498	1.41	2.21	32.53	27.71	36.14	3.95	0.95
Increasing knowledge of wildlife	498	1.81	4.42	28.31	37.95	27.51	3.85	0.94
Interacting with native people	500	1.40	4.00	33.40	32.00	29.20	3.84	0.94
Supporting economic benefits to local communities	498	2.21	7.03	29.72	34.54	26.51	3.76	0.99
Observing unusual plants and animal	499	2.00	6.41	29.06	36.87	25.65	3.78	0.97
Experiencing nature friendly sports	499	3.41	4.41	32.06	36.47	23.65	3.73	0.98
Learning about nature/creatures	499	3.61	7.21	29.86	35.87	23.45	3.68	1.02
Enjoying clean environment	503	0.20	0.80	12.13	29.62	57.26	4.43	0.75
Total number of observations				505				

To learn more about respondents’ perceptions of the environment and conservation in the CLC MPA, the surveyed respondents were asked to state what they considered was CLC MPA’s most essential value. Nearly 35% off all respondents chose “wildlife conservation” as the most critical value. Meanwhile, 30.61% of respondents agreed that “tourism” was the most important value, followed by “clean air and water” (26%). Two other options (jobs and foreign exchange, and local community development) were offered; only 8.6% of respondents chose these options. Two-thirds of the respondents were concerned about the environment and conservation issues in the CLC MPA. Respondents were also asked if they had participated in any environmental activities or events. Over 41% of respondents had participated in at least one environmental activity (such as litter collection on a beach/national park/residential area, the Earth hour campaign) or a conservation project (such as conservation in the Amazon jungle or trapping rodents in New Zealand).

Respondents were also asked to evaluate the quality of environmental amenities and the CLC MPA resources. Table 4.11 shows the results of these evaluations (from very poor to very good on a five-point Likert scale). Respondents were asked about nature, the beaches, and their perceptions of safety. The results show most respondents (503) enjoyed the CLC MPA’s natural beauty, with a mean of 4.28. Respondents also found the beaches attractive, with a mean score of 4.21. No respondent gave 1 (very poor quality) for nature and the beaches in the CLC MPA. A few respondents gave a 2 for nature and the beaches in the CLC MPA (0.6% and 1%, respectively). Respondents also indicated that they felt safe in the CLC MPA (a 4.1 average). The fact that respondents enjoyed their stay means they are more likely to return in the future. Respondents were least satisfied with the accommodation and visitor facilities (received a mean of only 3.69). The respondents were also concerned about two other environmental issues: local sanitation facilities/practices and the environmental quality of local ports, with means of 3.76 and 3.79, respectively.

Table 4.11: Respondents' quality evaluations and satisfaction with the CLC MPA

Category	Feature	Obs.	Mean	S.D.	Min	Max
Respondents' quality evaluation	Nature (marine and terrestrial)	503	4.28	0.65	2	5
	Beaches	499	4.21	0.72	2	5
	Historical/cultural/religious sites	487	3.69	0.78	1	5
	Visitor accommodation and facilities	487	3.61	0.80	1	5
	Feeling of safety	497	4.10	0.77	1	5
	Environmental sanitation in local villages	485	3.76	0.91	1	5
	Food and shopping	490	3.75	0.81	1	5
	Local ports environment	491	3.79	0.82	1	5
Respondents' satisfaction	Beaches and scenes	473	4.16	0.83	1	5
	Garbage collection and wastewater management	472	3.54	1.01	1	5
	Tourism services and facilities	461	3.74	0.85	1	5
	Eco-tourism experience (e.g., natural friendly activities)	470	3.88	0.97	1	5
	Cheap user fee and expenses	470	3.57	0.90	1	5
	Cultural/historical sites	464	3.60	0.86	1	5
	Camping areas	454	3.53	0.91	1	5
	Fresh air	472	4.35	0.74	2	5
	Coral reefs	468	4.01	0.91	1	5
	Total number of observations	505				

Like the CLC MPA characteristics, respondents' were largely happy with the activities and amenities in the CLC MPA (see Table 4.11). Respondents most enjoyed the fresh air, the beaches and natural scenery, and the coral reefs (means of 4.35, 4.6 and 4.01, respectively, on a satisfaction scale from unsatisfied to very satisfied). For respondents' satisfaction, "cheap user fee and expenses" was slightly above the median (3.57). The results indicate that respondents found the CLC MPA a little more expensive than anticipated. Respondents' scores for environmental issues, rubbish and wastewater management, suggest that they have some concern, with a mean of 3.54 for their satisfaction.

Most respondents understood the relationship between tourism and conservation in the CLC MPA. A five-point Likert scale (strongly disagree to strongly agree, 1 – 5) was used to measure respondents' opinions on the relationship between tourism and environmental protection/natural resource conservation (see Table 4.12). Respondents agreed that tourism should contribute to conservation efforts in the CLC MPA (a mean of 4.23), tourism should be combined with conservation to establish sustainable tourism (a mean of 4.18), and visitors' conservation awareness should be improved by integrating conservation education into tourism programmes (a mean of 4.0). Respondents also agreed that the protection of the CLC MPA is important to ensure its continued existence, even if it means no visitor activities on the island (a mean of 4.27). The questionnaire included the following statement: “No interaction between tourism and conservation in the CLC MPA” to examine respondents’ perceptions of the relationship between tourism and conservation. Unsurprisingly, the mean score was 2.04; this result indicates that respondents disagreed with the statement.

Table 4.12 Respondents’ understanding of the relationship between tourism and conservation/environmental protection of the CLC MPA

Conflict	Statement	Obs.	Mean	S.D.	Min	Max
Tourism v conservation	Tourism should contribute to the conservation of the CLC MPA	452	4.23	0.77	1	5
	Tourism poses a risk to the nature and environment in the CLC MPA	448	3.30	1.21	1	5
	Visitor fees charged by the MPA are an effective way to fund conservation programmes	450	3.84	0.89	1	5
	It is important to protect the CLC MPA even if visitors will never visit them	452	4.27	0.89	1	5
	There is no interaction between tourism and conservation in the CLC MPA	448	2.04	1.30	1	5
	The development of eco-tourism will encourage local people to participate in community-based conservation	445	4.07	0.81	1	5
	Better conservation programme in the CLC MPA will result in better visitor outcomes	446	3.95	0.90	1	5
	Tourism and conservation may be combined into a sustainable tourism programme	444	4.18	0.77	1	5
	A conservation programme is a compulsory part of tourism	442	4.00	0.94	1	5
Tourism v environmental protection	Wildlife and native plants are exploited for local socio-economic development	492	2.19	1.18	1	5
	There should be more interactive activities with coral reefs and nature	497	2.72	1.18	1	5
	Coastal environment and natural resources should be fully used for visitors’ enjoyment and relaxation	499	2.27	1.23	1	5
	More fishing to meet tourism demand	499	1.96	1.08	1	5
	Eco-tourism helps to strengthen the marine conservation effort	500	3.67	1.19	1	5
	Coastal areas and marine resources are important for the future of local people	498	4.18	0.92	1	5
	More resorts/hotels should be constructed to supply increased number of visitors	496	2.67	1.34	1	5
	More natural areas should be converted into tourist entertainment areas	500	2.15	1.21	1	5
	Total number of observations	505				

Respondents’ awareness of the relationship between environmental protection and tourism/development is important for the CLC MPA’s conservation efforts (and natural parks more generally). Respondents agreed that maintaining coastal areas and marine resources is vital for local people's future (a mean of 4.18) (see Table 4.12). They disagreed that wildlife, marine creatures or fish stock should be exploited for socio-economic or visitor development (means of 2.19 and 1.96, respectively). They also agreed that there should be no further development (i.e., transforming natural areas into tourist entertainment venues, constructing more resorts/hotels or increasing the use of natural resources) (means of 2.15, 2.67 and 2.27, respectively) (see Table 4.12).

4.5 Chapter Summary

This chapter has outlined the primary and secondary data collected for the study. This study used a structured questionnaire to collect primary data from respondents. Secondary data were sourced from the General Statistics Office, The World Population Review, the Ministry of Transport's regulations/circulars and technical reports, and official reports of the CLC MPA Management Board.

This chapter also described how the survey questionnaire was administered. All information obtained from the survey questionnaire, such as respondents' travel costs, their perceptions of the CLC MPA environment, their WTP for conservation efforts were used for analysis in the TCMs (see Chapter 5), and the respondents' WTP models (see Chapter 6).

This chapter also provided an overview of the surveyed respondents' socio-demographic characteristics and their perceptions of eco-tourism, focusing on environmental sustainability and conservation. Information about respondents' travel preferences, travel activities and costs were also gathered and analysed. Vietnamese and foreign respondents' characteristics were analysed separately. There are significant differences between these two groups of respondents in terms of their income, their number of visits to the CLC MPA over the past five years, and their travel group size.

Chapter 5

Travel Cost Models - Empirical Results and Discussion

5.1 Introduction

In this study, both ITCM and ZTCM are used to investigate the determining factors affecting respondents' tourism preferences for visiting the CLC MPA. ZTCM was used to examine the effects of different travel cost variables and other factors on the frequency of visits from 20 Vietnam and international administration zones. ITCM was used to analyse the impact of multi-destination trips in the trip demand models. The CS from these models was also calculated and compared.

The chapter is organised as follows: Section 5.2 investigates the determinants affecting demand using zonal models. This section also provides estimates for the price elasticity of demand using the zonal demand model. Section 5.3 discusses the effect of multi-destination trips on the demand model using individual models. Section 5.4 summarises the chapter's findings.

5.2 The Zonal Travel Cost Models

5.2.1 Assumptions and Calculations of the TCM Models

5.2.1.1 Travel Cost Specifications and Calculations

The critical factor in the demand model is the travel cost variable, which expresses the total expenses incurred as a result of the respondent's trip between his/her home and the recreational site, which, in this case, is the CLC MPA. In this study, three different travel cost variables were used and tested in ZTCM models, ***TC00***, ***TC1***, and ***TC2***, which are defined in Table 5.1. The opportunity cost of time is controversial in travel cost studies. Some authors argue that this price should be included in the travel costs (e.g., McConnell & Strand, 1981; Smith, Desvousges, & McGivney, 1983). Other scholars exclude it because of complications related to taxes and travel disutility (Loomis et al., 2000). In this study, the opportunity cost was added to only the ***TC2*** variable and was excluded from the other two travel cost variables (***TC00*** and ***TC1***) to test which zonal demand model(s) was/were most appropriate. The opportunity of time cost includes the cost of time for round trip and time spent onsite. Following Becker et al. (2005), Ezebilo (2016), and Ward and Beal (2000), a quarter hourly wage rate was applied to measure the opportunity cost of time (the constant k = ¼). According to Ahmad (2009) and Parsons (2003), a quarterly wage rate is the lower bound opportunity cost of time in a recreation valuation. For this study, it may help reduce overestimating the time opportunity cost.

Another issue in travel cost specification is related to onsite expenses. Some authors consider those expenses endogenous and do not include them in their travel cost calculations because respondents spend different amounts of money; in short, they are the result of individual choices. If the entrance fee (an exogenous cost) is included in the onsite expenses, it accounts for only a small portion of the total expenditure (Martínez-Espiñeira & Amoako-Tuffour, 2009). In contrast, onsite costs, including user fees, boat fees, and essential accommodation costs, for example, are considered exogenous and should be included in travel costs because these costs are minimum costs necessary to generate the trip (e.g., Fix, Loomis, & Eichhorn, 2000; Mitrică et al., 2013). In this study, onsite expenses were excluded from the ***TC00*** variable and included in the ***TC1*** and ***TC2*** variables to test if onsite expenses should be corrected to account for endogeneity or should be excluded from total travel cost calculations.

Table 5.1 Different travel cost variables

Travel cost	Component
TC00	Return fares or fuel costs from home to the CLC MPA only
TC1	Return fares or fuel costs from home to the CLC MPA + onsite costs
TC2	Return fares or fuel costs from home to the CLC MPA + onsite costs plus opportunity time cost spent for travel and onsite (at ¼ hourly wage rate)

The travel cost variable (***TC00***, ***TC1***, and ***TC2***) equations are outlined below in equations (5.1) (5.2) and (5.3):

$$TC00 = f\left(C_{a.fare}, C_{b.fare}, C_{t.fare}, C_{fuel}, C_{parking}, C_{bus-taxi}\right) \tag{5.1}$$

$$TC1 = f\left(C_{a.fare}, C_{b.fare}, C_{t.fare}, C_{fuel}, C_{onsite}, C_{parking}, C_{bus-taxi}\right) \tag{5.2}$$

$$TC2 = f\left(C_{a.fare}, C_{b.fare}, C_{t.fare}, C_{fuel}, C_{onsite}, C_{parking}, C_{bus-taxi}\right) \tag{5.3}$$

$$+1/4 * wagerate * tt_{opp.cost}$$

Where: $C_{a.fare}$ is the return airfare, $C_{b.fare}$ is the return fare for travel bus, $C_{t.fare}$ is the return train ticket, C_{fuel} is the cost for fuel, C_{onsite} is the total onsite expenses, including entrance fee, ferry fare, an environmental sanitation fee imposed by the local government, accommodation and food, and other essential expenses while visiting the CLC MPA. $C_{parking}$ is the parking fee if respondents travelled by their own vehicle (motorcycle, scooter or car), $C_{bus-taxi}$ is the return bus fare or taxi from the nearest airport/train station (Da Nang) to the CLC MPA, and from respondents' homes to the destination airport of their route and $tt_{opp.cost}$ is the total time cost for travelling (return) and onsite (the opportunity cost of time).

Respondents were asked to list their travelling costs. However, this cost was not included in the travel cost calculations for Vietnamese respondents because many respondents were unable to separate their travel costs (e.g., airfares), from their tourist package cost or some inaccurately estimated their costs. Instead, respondents' travel costs were aggregated using secondary data: various ministerial technical reports, Government regulations and publications, documents from international organisations, and other reliable websites.

Travel cost calculations depend on respondents' mode(s) of transport. As specified in Table 4.5, respondents used four main modes of transport to travel to the CLC MPA: flight + travel bus, travel bus/rented van, motorbike/scooter, and train. The following sections explain the travel cost calculations for respondents' different means of transport.

- **Travel by Travel Bus or Rented Bus**

Table 5.2 Distances and bus fare rate from respondents' home to CLC MPA entrance port

Origin	Distance (km)	Bus fare (VND/km/person)	
		In 2000	In 2018 (Discount rate 10.56%)
Binh Dinh Binh Thuan Ho Chi Minh city Quang Nam (Tam Ky) Quang Ngai	297 756 942 47 123	105	640
Da Nang Ha Noi Ha Nam Ha Tinh Hung Yen Nghe An Ninh Binh Quang Binh Quang Tri Thanh Hoa Thua Thien – Hue	30 789 734 446 765 495 701 296 200 641 123	100	609
Dak Nong Kon Tum	634 283	136	829
Dien Bien Gia lai	1127 355	179	1090
Khanh Hoa	510	118	719
Son La	975	146	889
Thai Nguyen	871	138	841
Vinh Phuc Tien Giang	841 999	127	774

Source: Technical Report No.3 and Map of Vietnam

The travel cost is calculated by multiplying the bus fare rate by the distance between the respondent's original province (administrative centre) and the CLC MPA entrance port. This study uses the bus fare rate from 2000 (outlined in Technical Report No.3[8]), with an average discount rate of 10.56%[9] per year. The price in 2018, the year the survey was conducted, was calculated by multiplying the bus fare rate in 2000 with the discount rate powered by 18. On average, the bus fare rate ranges from approximately VND 100 - 150 per km per passenger (in 2000) on all routes, except for routes from Dien Bien and Gia Lai provinces to the CLC MPA. The distance between respondents' home and the CLC MPA entrance port is calculated using the Vietnam map atlas website, as outlined in Table 5.2. This study uses administrative points as the respondents' home address to calculate fares and distances to the study site. Equation (5.4) is to calculate the cost of travelling by bus or rented bus:

$$\text{Cost of travelling} = \text{bus fare rate} \times (1+10.56\%)^{18} \times \text{distance} \qquad (5.4)$$

- **Travel by Plane**

Some domestic respondents were unable to determine the exact amount of their airfare (it was included in their tour package cost), so the fare information in Table 5.3 was used to calculate respondents' travel costs if the airfare indicated in the questionnaire was higher than the price listed in Table 5.3. In all other cases, we used the flight costs provided by the respondents. This ensured that we did not overestimate the travel cost. The total travel cost for respondents flying to the CLC MPA is a combination of their airfares and the return cost of travelling between airports and their homes/to the CLC MPA. All domestic airports are located far away from the administrative centre; thus, the distances between the respondents' homes and the airports are significant. In addition, respondents wanting to fly to the CLC MPA must fly into the closest airport in Da Nang, which is approximately 30 km away from the CLC MPA entrance port. This additional cost was added to the respondents' overall travel costs and was calculated using equation (5.4).

Table 5.3 Vietnamese domestic airway and airfare

Airway trip	Distance (km)	Maximum fare (VND/person, one-way)
Hanoi – Da Nang	629	2,200,000
Ho Chi Minh city – Da Nang	605	2,200,000
Nghe An – Da Nang	401	1,700,000
Hai Phong – Da Nang	601	2,200,000

Source: Circular No. 17/2019/TT-BGTVT of the Ministry of Transport on the Issuance of Prices for Passenger Transport Services on Domestic Air Routes.

[8] Technical Report No.3: The Transport Cost and Pricing in Vietnam in 2000, was published by the Japan International Cooperation Agency (JICA), the Ministry of Transport, the Socialist Republic of Vietnam (MOT), and the Transport Development and Strategy Institute (TDSI)).
[9] This discount rate used is from the World Bank statistics (2018)

- **Travel by Motorbike - Scooter (two-wheeled vehicles)**

The travel costs (from home to the CLC MPA and return) for those on motorbikes include fuel costs, depreciation and other costs such as parking fees. The fuel cost was calculated by multiplying the distance (between the respondents' origins and the CLC MPA), with fuel unit costs per kilometre for the return route (Benson et al., 2013). In Vietnam, fuel consumption varies depending on the type of roads on which people travelling. Average fuel consumption ranges from 1.5 – 2.84[10] litres per 100 km for two-wheeled vehicles, for inter-city or national highways in plains and lowlands. The mean fuel unit price applied at the time the survey was conducted (February – May 2018) was VND 20,700 per litre for RON 95 gasoline (the most popular one for motorbike users). The fuel unit cost per kilometre ranges from VND 31,050 to VND 58,788. The midpoint of this range was used to calculate respondents' fuel costs. Respondents who visited the CLC MPA in a group were assumed to share fuel costs, thus saving on fuel costs and parking fees. The costs were calculated by dividing total fuel costs and parking fees by two (the maximum number of adults allowed on one motorbike or scooter). As respondents did not provide their residential addresses, travel distance was calculated from the nearest administrative centre to their homes to the CLC MPA.

The depreciation cost (the cost of tires and vehicle maintenance), is excluded from fuel cost estimates in some studies because of the detail needed to assess this cost and interview time limitations (Mangan et al., 2013; Zeybrandt & Barnes, 2001). However, Gürlük and Rehber (2008) suggest that the depreciation cost can be estimated using 1% of the total fuel cost. The current study used this rate to calculate the depreciation cost.

- **Travel by Train**

There is no train station close to the CLC MPA entrance port. Respondents who travel by train must arrive at the nearest station in Da Nang and organise another form of transport to the site. In addition to train tickets, respondents must pay for their return trip from Da Nang station to the CLC MPA entrance port. This study assumes that the respondents' departure from the train station is within their neighbourhood, and thus the cost of travelling to the station is negligible.

5.2.1.2 Other Assumptions and Calculations

- **Onsite Expenditure**

As there is no luxury accommodation or fancy restaurant in the CLC MPA, respondents' onsite costs are minimal (overnight or one-day trip). The onsite cost also includes the entrance fee, local

[10] These estimates are from the Environmental Division of the Vietnam Register Report (2014).

environmental sanitation fee and ferry fee. The results show that 63.56% of the respondents were on a one-day trip, which means that their onsite expenses were primarily for essentials such as food, user fees and ferry fees. Table 5.4 shows the respondents' onsite costs. Most respondents spent between VND 500,000 – VND 2,000,000 during their CLC MPA visit (75.64%).

Table 5.4 Respondents' onsite costs at the CLC MPA (VND)

Cost	Frequency	Percent	Cum. percent
Less than 500,000	14	2.77	2.77
500,000 – 1,000,000	191	37.82	40.59
1,000,000 – 2,000,000	191	37.82	78.42
2,000,000 – 4,000,000	89	17.62	96.04
4,000,000 – 8,000,000	17	3.37	99.41
Over 8,000,000	3	0.59	100.00
Total observations	505		

The mid-point intervals for respondents' onsite expenditure was used to calculate their onsite costs (adapted from Botzen & van Den Bergh, 2012; Fleming & Cook, 2008). VND250,000 and VND10,000,000 were used for the lowest and highest categories ("Less than VND500,000" and "Over VND8,000,000", respectively).

- **Opportunity Cost of Time**

The opportunity cost of time covers the opportunity time cost associated with travelling to the CLC MPA and onsite spending. The respondents' travel time to the CLC MPA (one way), ranged from 15 minutes to 72 hours. Their onsite time ranged from one to 15 days. All respondents' onsite time (in day units), was converted into hours. Respondents visiting the CLC MPA were not working (an eight-hour day), which meant that their onsite time is calculated based on the number of hours they did not work (off-work day(s) x eight hours). This conversion rate was chosen because most respondents spent one day (or at eight hours onsite) at the CLC MPA (63.56% of the sample). The opportunity cost of time was determined by equation (5.5).

$$TimeCost = Time_{travel,onsite} * k \qquad (5.5)$$

Where: $Time_{travel,onsite}$ is the total time the respondent spent travelling plus the onsite time at the CLC MPA. The k constant is the fraction of the hourly wage rate. Choosing an exact value for k is controversial. McConnell and Strand (1981) estimate the value of k at 0.612 times the wage rate; Cooper and Loomis (1993) chose half the wage rate for their respondents. In their study, Benson et al. (2013) use a k of on third and one quarter of the wage rate. Some studies use a third of the wage rate (Chae et al., 2012; Fix et al., 2000; Li, Liu, Zhang & Li, 2009; McKean et al., 2012) as their approach. Becker et al. (2005), Ezebilo (2016), and Ward and Beal (2000), use a quarter standard wage rate in their travel cost studies. In this study, the k constant was tested at both the one third and one quarter wage rate, but only the latter was used in the TCM models because a higher *k* value led to stratification and dispersion in travel cost calculations between domestic and foreign respondents, as well as between employed and unemployed respondents (e.g., students or homemakers). The mean wage rate of domestic respondents is almost 10 times lower than that of foreign respondents, VND29,000 and VND286,000 per hour, respectively. Cesario and Knetsch (1970) indicate that using a higher wage rate may bias the time cost estimate. In addition, Benson et al. (2013), Bockstael et al. (1987), and Seller et al. (1985) point out that the model becomes more sensitive with level of wage rate (a quarter, a third or full) applied in a time cost estimation. Moreover, the CS is overestimated when a higher wage rate is used. Thus, the quarter rate is more appropriate for this study.

Respondents' hourly wage was determined using their monthly income and dividing it by 22*8 (assuming full-time workers have 22 working days per month and eight working hours per day). Voke et al. (2013) assume that students and unemployed/homemakers do not have a wage (zero). This study also applied a zero-wage rate for respondents in these categories. Equation (5.5) is thus rewritten as equation (5.6). *INC* stands for the respondent's average monthly income:

$$TimeCost = Time_{travel,onsite} * \frac{1}{4} * \frac{INC}{22*8} \qquad (5.6)$$

Vietnamese respondents' monthly incomes were obtained from the Vietnam census and demographic data from the survey. To determine individual monthly income we used statistics from Vietnam GSO (2016). GSO divides individual income into five quintiles for each Vietnamese province. Higher income categories have a greater probability of holidaying further away from their homes, thus, in this study, the individual income variable was determined using the mean of individual income from the two highest income groups.

We used household monthly income (as provided in the surveys) for overseas respondents and divided it by the total number of income earners in the respondent's household. The midpoints of the household income brackets in the survey were used to calculate the wage rate. One respondent did not provide income information; in this case, we used average monthly individual income from her country's statistics. In this study, two different sources of income were used to calculate individual wage rates. Statisticians recommend the use of multiple data sources in modelling because it can help to improve statistical efficiency (National Academies of Sciences, Engineering, & Medicine, 2017).

5.2.2 Results and Discussion

5.2.2.1 Descriptive Statistics of Zonal Demand Models

- **Zone Selection and Visitation Rates**

Clawson and Knetsch (1966) developed the TCM, which is based on respondents' origins (region or zone). It assumes that frequent visit rates to a recreation area depend on the visitor's original zones/regions and the population of those regions/zones. In this study, the sampled respondents' origins were divided into 21 zones based on administrative units. Zone(s) with one observation were excluded from the zonal demand models. One zone was dropped from this study, leaving a total of 20 zones. Concentric circles encompassing the CLC MPA were not suitable for defining zones because of the difficulty determining the population for each boundary. Table 5.5 presents the zone definitions, visit frequency, population, and visitation rate for each zone. The 2017 population rates for respondents' zones were taken from the General Statistics Office of Vietnam (for Vietnamese respondents) and from The World Population Review (for overseas respondents). In the ZTCM estimates, respondents' origins were treated as their point of departure regardless of differences in their origin and their country of birth/citizenship.

Table 5.5 Respondents' zone of origin, population and visitation rate

Zone	Administration province/country	Frequency	Population ('000)	Visitation rate (per 10,000) %
1	Ha Noi	92	7,420.10	12.4
2	Phu Tho, Thai Nguyen, Lang Son	5	3,426.40	1.46
3	Dien Bien, Son La	7	1,795.90	3.90
4	Vinh Phuc, Bac Giang, Bac Ninh, Hai Duong, Hung Yen	27	6,942.70	3.89
5	Thai Binh, Ha Nam, Nam Dinh, Ninh Binh	11	5,412.40	2.03
6	Hai Phong, Quang Ninh	34	3,241.30	10.49
7	Thanh Hoa, Nghe An, Ha Tinh	23	7,947.90	2.89
8	Quang Binh, Quang Tri, Thua Thien - Hue	41	2,664.10	15.39
9	Da Nang	69	1,064.10	64.84
10	Quang Nam	57	1,493.80	38.16
11	Quang Ngai, Binh Dinh	17	2,790.60	6.09
12	Phu Yen, Khanh Hoa, Binh Thuan	5	3,357.00	1.49
13	Dak Nong, Gia Lai, Kon Tum	8	2,583.00	3.1
14	Long An, Tien Giang, Ben Tre	4	4,515.30	0.89
15	Binh Duong, Dong Nai, Ba Ria – Vung Tau	4	6,199.90	0.65
16	Ho Chi Minh city	27	8,444.60	3.2
17	Asia (Japan & Hong Kong, Singapore & Thailand)	4	209,759.87	0.02
18	North America (Canada & U.S.)	5	364,170.83	0.01
19	Europe (Denmark, Norway, Sweden, UK, Belgium, France, Germany, Holland, Switzerland, Czech Republic & Poland)	53	321,972.98	0.16
20	Oceania (Australia & New Zealand)	11	29,641.28	0.37
	Average			18.35
	Total observations	504		

Table 5.5 shows that the zone closest to the CLC MPA (zone 9) had the highest visitation rate (***VR***) value at 64.84%. Zone 9 is Da Nang, approximately 30 km from the CLC MPA. This means that of 10,000 residents in zone 9, 65 individuals will visit the CLC MPA. The next highest ***VR*** is zone 10 (38.16%). This zone is the administrative unit of the CLC MPA, Quang Nam province. The North America (zone 18) ***VR*** was the lowest, at approximately 0.01%. This figure means that only one person out of a million U.S. or Canadian residents would visit the CLC MPA. The ***VR*** for Asian countries was also low (0.02%) because of a small number of observations. It may also be because of communication problems (i.e., communicating in a foreign language).

- **Descriptive Statistics for Other Variables in the Zonal Demand Models**

Table 5.6 shows respondents' related costs for travel, their onsite expenses, and the opportunity cost (of time) for 20 different zones. The travelling and time costs were corrected for each destination allocation of respondents' multiple destinations during their trip. The highest travel costs, onsite expenses and time costs were for respondents in zones 18, 17, and 18. The lowest costs were for respondents in zones 9, 3, and 3. For travelling, the peak price (VND 5,140,160) was approximately 177

Table 5.6 All costs and the trip-related time from different origins

Cost unit: '000 VND

Zone	Total cost of travel	Onsite cost	Opportunity cost of time	Travel time (return, hrs)	Days in CLC MPA
1	1,393.86	1,820.65	188.62	9.98	1.35
2	1,321.7	1,950	88.5	16.4	1.2
3	599.19	1,107.14	51	43.43	1.14
4	1,417.57	2,083.33	104.93	13.93	1.3
5	992.09	1,568.18	120.79	16.73	1.36
6	1,462.07	2,051.47	139.37	9.15	1.25
7	440.46	1,804.35	75.26	19.65	1.17
8	125.03	1,317.07	88.91	8.42	1.37
9	29.85	1,123.19	159.44	3.03	1.52
10	49.46	1,157.9	84.91	2.97	1.7
11	205.54	1,544.12	94.22	6.29	1.71
12	294.17	1,350	121.25	24	1.2
13	327.9	1,968.75	82.27	19	1.13
14	794.92	1,125	87.52	17	1
15	601.86	1,312.5	136.91	16	1
16	1,283.01	2,203.7	186.71	10.52	1.44
17	2,806.55	3,437.5	1,021.65	11	1.5
18	5,140.16	3,350	14,509.85	48.4	4.2
19	2,195.84	1,924.53	1,436.35	54.26	2.06
20	3,166.75	1,181.82	1,141.73	35.76	1
Average	5,322.5	1,648.31	441.26	15.28	1.49

times higher than the lowest cost (VND 29,850), and more than five times higher than the mean of all zones (at VND 980,214). Respondents from zone 9 spent the least for their travel and the second lowest for their onsite costs (VND 1,123,190). The opportunity cost of time ranged from VND 51,000 to VND 14.5 million; the mean was VND 441,263 and the median opportunity cost was VND 125,269. Respondents from the U.S. and Canada (zone 18) spent the most on their travel and the opportunity cost of time (VND 5,140,160 and VND 14,509,850, respectively).

The last two columns in Table 5.6 present the average amount of time respondents from each zone spent travelling from their home to the CLC MPA (return) and the mean number of days they spent in the CLC MPA. Generally, it took between 2.97 and 54.26 hours to travel from the respondents' home zone to the CLC MPA; i.e., approximately 33 times difference between the lowest and highest travel time (zone 19 and 10, respectively). The mean respondent travel time was 15.28 hours, more than five times higher than the shortest travel time. Respondents in zones 14, 15, and 20 only spent a day in the CLC MPA (the mean equals one). Respondents from zone 18 spent the most time in the CLC MPA (4.2 days, on average). The second longest average time spent onsite, 2.06 days, was by respondents from zone 19. Respondents from only four zones (9, 11, 18, and 19) had higher onsite times than the all zones mean of 1.49 days.

The descriptive statistics for the independent variables and dependent variable (***VR***) of the ZTCM models are provided in Table 5.7. The dependent variable and independent variables of travel cost are in logarithmic form in the zonal demand models. The mean of the natural logarithm of visitation rate is 1.84 (the mean visitation rate is 18.16). This means that approximately 18 respondents in 10,000 inhabitants from the zone visit the CLC MPA. The means of the logarithm of travel costs Ln(***TC1***) and Ln(***TC2***) are 7.6 and 7.71, respectively (or VND 2,628 million and VND 3,069 million for ***TC1*** and ***TC2***, respectively). The mean income is high because of foreigners' higher incomes. On average, respondents spent approximately 6.9 days on their trip (including their visits to the CLC MPA). The longest journey was 150 days and the shortest trip was a single day.

Six variables using a Likert scale were included in the study's zonal demand models. Of these six variables, ***nattoursim*** and ***cheap*** demonstrate the importance of the respondents' motivation for their trips to the CLC MPA. ***Nature*** and ***qlty_beach*** refer to the respondents' evaluations of the CLC MPA quality (quality relates to the marine and terrestrial nature, and the quality of the beaches on the island). ***Tourism*** and ***cleanair_water*** refer to respondents' reasons for choosing to visit/holiday at an eco-friendly site (in this case, the CLC MPA).

Table 5.7 Descriptive statistics of the dependent and independent variables (n=504)

Variable	Description	Mean	S.D.	Min	Max
Ln(VR)	Visitation rate (the number of visits from original zones per 10,000 inhabitants)	1.84	1.93	-4.29	4.17
Ln(TC1)	Travel cost + onsite costs ('000VND)	7.6	0.74	5.57	9.99
Ln(TC2)	Travel cost + onsite costs + opportunity cost of time ('000VND)	7.71	0.74	5.74	11.35
Respondents' demography					
inc	Average individual monthly income ('000VND)	13,895	25,726	2,184	246,000
hhsize	The number of household members	4.15	1.51	1	12
vne	1 = If respondent is Vietnamese; 0 = otherwise	0.85	0.36	0	1
gender	1 = Female; 0 = otherwise	0.54	0.5	0	1
age5	1 = If respondent is 56 – 65 age; 0 = otherwise	0.03	0.18	0	1
professionals	1 = If Respondent is staff or professionals; 0 = otherwise	0.35	0.48	0	1
retired	1 = If respondent is retired; 0 = otherwise	0.02	0.15	0	1
highschool	1 = If respondent has completed highshool; 0 = otherwise	0.19	0.4	0	1
Respondents' tourism information and activities					
timeCLC	The number of days respondents stayed in CLC MPA	1.49	1.13	1	15
timetrip	The total days of respondents' trip	6.9	14.61	1	150
homestay	1 = If respondents use homestay while visiting CLC MPA; 0 = otherwise	0.3	0.46	0	1
entrancefee	1= If respondent knew the cost of entrance fee; 0 = otherwise	0.49	0.5	0	1
travelbus	1= If respondent use travel bus; 0 = otherwise	0.26	0.44	0	1
train	1=If respondent use train; 0 = otherwise	0.01	0.09	0	1
vacation	1 = If respondent is on vacation/holiday; 0 = otherwise	0.93	0.25	0	1
business	1 = If respondent's visit is for business; 0 = otherwise	0.05	0.21	0	1
study	1 = If respondent's visit is for study/research; 0 = otherwise	0.04	0.19	0	1
sport	1 = If respondent's visit is for sports/recreation; 0 = otherwise	0.18	0.39	0	1
seafood	1 = If respondent enjoys seafood lunch by the seaside; 0 = otherwise	0.78	0.42	0	1
seatrekking	1 = If respondent enjoys sea trekking; 0 = otherwise	0.05	0.22	0	1
Respondents' motivation for trip and recreation evaluation (Likert scale)					
nattourism	Experiencing nature tourism. 1 = not important; 5 = most important	4.0	0.88	1	5
cheap	Spending less money than other places. 1 = not important; 5 = most important	2.28	1.07	1	5
nature	Quality of CLC MPA nature. 1 = very poor; 5 = very good	4.28	0.65	2	5
qlty_beach	Quality of CLC MPA beaches. 1 = very poor; 5 = very good	4.21	0.72	2	5
nativepeople	Interacting with native people. 1 = less important; 5 = most important	3.87	0.94	1	5
cleanenv	Enjoying clean environment. 1 = less important; 5 = most important	4.43	0.75	1	5
Respondents' valuation of the CLC MPA most important value					
val_wildlife	1 = Wildlife conservation; 0 = otherwise	0.33	0.47	0	1
val_tourism	1 = Tourism; 0 = otherwise	0.29	0.45	0	1
val_cleanairwater	1 = Clean air/water; 0 = otherwise	0.24	0.43	0	1

5.2.2.2 Results Discussion

The linear regression model was chosen for the zonal demand model estimates. Because of the non-normal distribution of the dependent variable (***VR***), this study used the Box-Cox approach. This method is used to transform the dependent variable into a normal shape. The independent variables (travel cost variables) are skewed with a non-normal distribution. They were also transformed into a different form. Both the dependent and the independent variables (travel cost) were transformed into a logarithmic form. This form of ***VR*** and travel cost was then applied to the zonal demand models (called log-log form), identical with some previous studies (e.g., Fleming & Cook, 2008; Hossain & Islam, 2016). In those studies, the double log form performed better than other forms.

This study examined three log-log regression demand models with three different travel cost variables. However, the model with the travel cost variable ***TC00*** did not satisfy the assumptions of normal distribution for residuals. Thus, only models with travel cost variables ***TC1*** and ***TC2*** (as described in equations (5.7) and (5.8)) are presented and discussed:

Model 1:

$$Ln(VR) = f(Ln(TC1), inc, hhsize, vne, gender, age5, professionals, retired, highschool, timeCLC, timetrip, homestay, entrancefee, travelbus, train, vacation, business, study, sport, seafood, seatrekking, nattourism, cheap, nature, qlty\_beach, nativepeople, cleanenv, val\_wildlife, val\_toursim, val\_cleanairwater) \quad (5.7)$$

Model 2:

$$Ln(VR) = f(Ln(TC2), inc, hhsize, vne, gender, age5, professionals, retired, highschool, timeCLC, timetrip, homestay, entrancefee, travelbus, train, vacation, business, study, sport, seafood, seatrekking, nattourism, cheap, nature, qlty\_beach, nativepeople, cleanenv, val\_wildlife, val\_toursim, val\_cleanairwater) \quad (5.8)$$

The independent variables were tested to eliminate highly correlated variables. We intended to include other independent variables but they were not successful because of multicollinearity problems and decreased levels of significance. For example, the ***distance*** variable (which describes the distance between respondents' homes and the CLC MPA) was correlated with ***inc*** at 0.736.

The two models were tested for robustness as well as model specification. The model specification error tests (link test and Ramsey RESET test) indicated that the *p-values* were higher than 0.05 (0.15 and 0.26 for Models 1 and 2, respectively). This means that the null hypothesis (that models fit the observation data) could not be rejected. In other words, Models 1 and 2 are specified without any omitted independent variable or included irrelevant independent variable.

To test for homogeneity of variance of residuals in the models, we used a variety of tests (the White and Cameron-Trivedi's test, and the Breusch-Pagan/Cook-Weisberg tests). The results show that, except for White and Cameron-Trivedi's test, the *null* hypothesis of homoscedasticity can be rejected ($p < 0.05$). Thus, the two models were regressed under the robustness test of errors.

Three different tests were used to test the normal distribution of residuals in Models 1 and 2: Skewness-Kurtosis, Shapiro-Wilk and the Jarque-Bera normality tests. All *p-values* were higher than 0.05, which means that the *null* hypothesis (normality of residuals) cannot be rejected.

Table 5.8 shows the OLS estimates from the two zonal demand models (in log-log form). Summaries of the models' statistics are presented at the bottom of Table 5.8. Both models are statistically significant, with *p-values* smaller than 0.01 (*F-statistics*). The *R-square* values are not significantly different between the two models and are both over 70% (74.76% and 74.53% for Models 1 and 2, respectively), which means that our observations fit well for the linear regression models.

Thirteen predictors (***inc, hhsize, vne, gender, highschool, timeCLC, timetrip, homestay, travelbus, train, business, qlty_beach*** and travel cost ***(TC1)***) are statistically significant in Model 1. Twelve predictors (***hhsize, vne, gender, highschool, timeCLC, timetrip, homestay, travelbus, train, business, qlty_beach*** and travel cost ***(TC2)***) are statistically significant in Model 2 ($p < 0.10$). Generally, the coefficients and standard errors of these variables differ slightly from Model 1 to Model 2, except for ***inc***. There are overlaps in the 95% confidence intervals of the variables, which means that there is little difference in terms of the impact of these variables on the dependent variable (***VR***) between the two models. The ***inc*** variable has a different impact on the ***VR*** between the two models. It has significant impact on the ***VR*** in Model 1 with a *p-value* < 0.05, whereas, it is not statistically significant in Model 2.

The ***inc*** coefficient is statistically significant at 5% and negative in Model 1, which suggests that the CLC MPA is more attractive to lower-income visitors. This finding is consistent with previous travel cost studies. For instance, Chae et al. (2012) find that respondents' income negatively affects their visit to the Lundy Marine Nation Park in the UK. Creel and Loomis (1990) find that the income coefficient was negative in all their models, like previous travel cost studies. Loomis et al. (2000) find that the income coefficient was also negative when estimating the travel cost demand model for whale watching activities. The negative ***inc*** coefficient implies that the recreational goods and services provided by the CLC MPA are inferior compared with other nearby goods, such as the Hoi An ancient town or Da Nang beaches. However, the impact of a change in respondents' income on changes to visitation rates is relatively low. In terms of the marginal effect, Model 1 shows that if a respondent's income increases

Table 5.8 The double log form of the zonal demand models

	Model 1				Model 2			
Variable	**Coef.**	**Robust S.E.**	**95% Confidence interval**		**Coef.**	**Robust S.E.**	**95% Confidence interval**	
inc	-6.38e-06**	2.97e-06	-1.22e-05	-5.46e-07	-3.06e-06	3.04e-06	-9.03e-06	2.92e-06
hhsize	-0.064*	0.038	-0.138	0.010	-0.069*	0.038	-0.143	0.005
vne	3.104***	0.271	2.571	3.638	3.053***	0.277	2.508	3.598
gender	-0.365***	0.093	-0.548	-0.182	-0.368***	0.094	-0.552	-0.184
age5	0.225	0.239	-0.245	0.695	0.220	0.241	-0.253	0.693
professionals	-0.040	0.106	-0.248	0.168	-0.036	0.106	-0.245	0.173
retired	-0.208	0.333	-0.863	0.447	-0.182	0.337	-0.844	0.480
highschool	-0.207*	0.111	-0.426	0.011	-0.211*	0.112	-0.430	0.009
timeCLC	0.160***	0.045	0.071	0.248	0.186***	0.044	0.100	0.272
timetrip	-0.018***	0.004	-0.027	-0.010	-0.017***	0.004	-0.026	-0.008
homestay	0.297***	0.110	0.080	0.513	0.327***	0.109	0.112	0.542
entrancefee	-0.105	0.097	-0.295	0.086	-0.105	0.097	-0.296	0.086
travelbus	-0.366***	0.117	-0.596	-0.136	-0.376***	0.118	-0.607	-0.144
train	-1.675***	0.545	-2.746	-0.605	-1.692***	0.547	-2.766	-0.617
vacation	0.379	0.254	-0.120	0.879	0.374	0.255	-0.126	0.874
business	0.570**	0.260	0.060	1.080	0.558**	0.259	0.049	1.067
study	0.136	0.273	-0.400	0.672	0.133	0.275	-0.406	0.673
sport	0.114	0.117	-0.116	0.343	0.105	0.117	-0.125	0.336
nattourism	-0.026	0.054	-0.131	0.080	-0.024	0.054	-0.130	0.083
cheap	-0.050	0.040	-0.130	0.029	-0.050	0.041	-0.130	0.030
seafood	0.200	0.128	-0.051	0.450	0.204	0.128	-0.047	0.456
seatrekking	-0.037	0.200	-0.429	0.356	-0.031	0.203	-0.429	0.367
nature	0.132	0.089	-0.042	0.306	0.124	0.089	-0.050	0.299
qlty_beach	-0.128*	0.072	-0.269	0.013	-0.125*	0.072	-0.268	0.017
nativepeople	-0.062	0.048	-0.156	0.032	-0.061	0.048	-0.156	0.034
cleanenv	-0.089	0.058	-0.203	0.025	-0.089	0.058	-0.204	0.026
val_wildlife	0.092	0.157	-0.217	0.400	0.080	0.158	-0.230	0.391
val_ tourism	0.158	0.167	-0.170	0.486	0.149	0.167	-0.179	0.478
val_cleanairwater	0.077	0.170	-0.257	0.411	0.067	0.171	-0.268	0.403
Ln(TC1)	-0.927***	0.077	-1.078	-0.777				
Ln(TC2)					-0.995***	0.083	-1.159	-0.831
Constant	6.979***	0.825	5.357	8.600	7.595***	0.862	5.901	9.289
Observations	504				504			
F-test	53.119***				53.865***			
R-squared	0.7476				0.7453			

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

by a 1,000 unit (VND 1,000,000 or about US$ 44.6 per month), the ***VR*** decreases by 0.64%, all other factors being constant.

The number of household members (***hhsize***) has a negative impact on the ***VR*** in both models at the 10% significance level. Although the standard errors are the same in both models, the coefficients are not equal; there is a difference of over 7%. The results show that if the ***hhsize*** increases by one unit, the ***VR*** decreases by 6.4% and 6.9% in Models 1 and 2, respectively. This finding suggests that households with more members are less likely to organise a trip to the CLC MPA, like Benson et al.'s (2013) finding. There is also a relationship between the respondents' household size and individual income. Respondents from larger households have lower individual incomes, which means that they are less likely to holiday further away from home. In general, Table 5.9 shows that monthly individual income decreases with increased household size. Respondents from a single–member household have an income over ten times higher than that of respondents from four-member households and over 20 times that of respondents from 12-member households. The Pearson correlation test indicates that the ***hhsize*** and ***inc*** are significantly correlated at 1% level.

Table 5.9 The relationship between average individual income and household size

Number of household members	Income (mean) '000 VND
1	76,160
2	41,574.08
3	12,648.63
4	7,400.714
5	7,260.925
6	5,985.102
7	5,367.125
8	6,068.25
9	8,481.5
10	5,263.83
12	3,733.5

Besides ***hhsize***, two other demographic variables (***gender*** and ***highschool***) have statistically significant, negative impacts on ***VR*** in Models 1 and 2 ($p<0.01$ and $p<0.1$, respectively). If respondents are female, ***VR*** decreases from 36.5% to 36.8%, which means that the CLC MPA is less attractive to women than men. This may be because men are more likely to enjoy the recreational or water activities at the CLC MPA, thus are more likely to visit. If the respondents' highest education level is high school, the ***VR*** decreases by 20.7% and 21.1% in Models 1 and 2, respectively. Two occupation variables (***professionals*** and ***retired***) were added into the models to examine their role in respondents' decisions to visit the CLC MPA. However, they were not statistically significant.

The race variable (***vne***) was statistically significant in both models, with *p-values* < 0.01. If the respondent is Vietnamese, then the ***VR*** increases by 310% in Model 1 and 305% in Model 2. Obviously, there are advantages associated with transport. Similarly, as a result of their proximity to the CLC MPA, they spend less time travelling there and thus are more likely to visit than a foreigner. Most survey respondents were Vietnamese (84.72%), which impacts the ***VR***. This finding supports previous studies such as Benson et al. (2013) who find that minorities and long-distance respondents are less likely to visit recreational sites or do not visit sites with a large number of local visitors.

For the respondents' transport means, the results in Table 5.8 show that travelling by bus or train to the CLC MPA has a significant, negative impact on ***VR*** (both ***travelbus*** and ***train*** have *p-values < 0.01*). The level of the impact differs significantly. The ***VR*** in Models 1 and 2 decreases by 36.6% and 37.6%, respectively, if respondents visit the CLC MPA by bus. However, the ***VR*** in Models 1 and 2 decreases by 168% and 169%, respectively, if they travel by train to the CLC MPA. This is 4.5 times higher than the impact on respondents who travel by bus. This finding also suggests that the respondents prefer to visit the CLC MPA using another mode of travel (as opposed to bus or train).

Unlike the above variables, respondents' decisions on accommodation and other factors have a significant, positive influence on the ***VR***. For instance, respondents who stayed overnight in a CLC MPA homestay (***homestay***) are positive and significant at the 1% significance level, in terms of the effect on ***VR***. In other words, the ***VR*** will increase by 29.7% and 32.7% (Models 1 and 2, respectively) for respondents staying in homestay accommodation while visiting the CLC MPA. In addition, their time spending onsite (***timeCLC***) is also statistically significant (*p< 0.01*) and positively impacts the ***VR*** at 16% and 18.6% (Models 1 and 2, respectively) if their days in CLC MPA increase by one day. This finding is similar to those in previous studies. For example, Benson et al. (2013) find that if respondents spend more days in a recreation site this has a positive significant impact on the travel cost demand models. However, this is not true for the influence of respondents' total trip time on the ***VR***. Each additional day on their total trip (***timetrip***) decreases the ***VR*** by 1.8% and 1.7% (Models 1 and 2, respectively) at the 1% significance level. This means that respondents who are on a longer holiday are less likely to visit the CLC MPA.

Respondents' trip purpose also affects the ***VR*** positively. Respondents on business trips are more likely to visit by 57% and 56% (Models 1 and 2, respectively) at the 5% significance level. Respondents on business have no other alternative but to visit the CLC MPA. Other respondents' visit purposes (***vacation, study,*** and ***sport***) were included in the models but were not statistically significant.

It was surprising that in both models the respondents' evaluation of beach quality at the CLC MPA negatively affected the ***VR***. The ***qlty_beach*** variable in Table 5.8 shows that the ***VR*** decreases by 12.8%

and 12.5% (Models 1 and 2, respectively) when respondents' evaluation increases 1 point on a 5-point Likert scale rating the beach quality in the CLC MPA. The lowest point (1) indicates very poor quality and the highest point (5) indicates very good quality. This finding is at odds with Cooper and Loomis's (1993) study found that the quality of recreation characteristics (level of water delivery for wetland for waterfowl hunting) had a positive effect on the trip demand model. Unlike others (e.g., amount of rainfall), this characteristic is socially controllable or policy relevant. In this study, beach quality is controllable but also possibly affected by the increased in number of site visitors (uncontrollable). When a good quality beach becomes popular or famous, it may become crowded making it less attractive to visitors on eco-holidays or those looking for a natural experience.

The most important factor in the demand models, the travel cost variables, are statistically significant in both models with *p-values* < 0.01 (Table 5.8). There is approximately a 7% difference between the models in the coefficient of travel cost (logarithm) and the standard errors. Models 1 and 2 show that the significant travel cost coefficient is negative, the same as in previous travel cost studies. This indicates that the visitation rate decreases when the travel cost between respondents' homes and the recreation site increases. For example, Zeybrandt and Barnes (2001) show that the ***VR*** of anglers on fishing trips to the Namibian marine shore decreases by 5.5×10^{-6} if the cost increases by 1% (with mixed time cost). Govigli, Górriz-Mifsud and Varela (2019) find that a one unit increase in travel cost decreases the ***VR*** for all zones by 4.5% and 2.9% for onsite survey data and online survey data, respectively. The negative relationship between travel cost and ***VR*** means that the demand curve slopes downwards. In this study, a 1% increase in travel costs (logarithm) decreases the ***VR*** by 0.927% and 0.995% (Models 1 and 2, respectively).

This finding indicates that when the travel costs to visit the CLC MPA increase, visitors are more likely to choose other places of similar quality (goods/services) that have lower travel costs. This finding is the same as Hynes and Greene (2013), and Mangan et al. (2013). In those studies, the respondents reported that the average travel cost to visit substitute sites was lower than for the main recreation areas. The travel costs of substitute sites were added into the demand models to examine how they influenced visits to the main site. The authors' estimates showed that the cost significantly, positively affected the demand model, which means that substitute sites become the respondents' primary choice if the travel cost to visit the main recreation site increases.

A comparison of the 95% confidence intervals of the travel cost variable in both models (Table 5.8) shows that their values have an almost 95% overlap, which implies that there is a little difference when adding time cost to the travel cost. The ***VR*** in the demand model with time cost added is more affected; it is approximately 7% higher than the model without the added time cost.

- **Price Elasticity of Demand**

Price and income elasticity of demand are usually included in demand models (e.g., Bell & Leeworthy, 1990; McKean et al., 2012; Moeltner, 2003). However, the income variable is statistically significant only in Model 1. This study examines only the price elasticity of demand which compares changes in ***VR*** changes in travel costs (price). As the log-log form of the zonal demand model (with ***TC1*** and ***TC2***) is the best-fit and is consistent in terms of significance, the demand functions will be used to estimate the elasticity as shown in equations (5.9) and (5.10). These equations correspond to Models 1 and 2 in Table 5.8:

$$Ln(VR) = 6.979 - 0.927Ln(TC1) - 6.38e\text{-}06inc - 0.064hhsize + 3.104vne - 0.365gender + 0.225age5 - 0.04professionals - 0.208retired - 0.207highschool + 0.16timeCLC - 0.018timetrip + 0.297homestay - 0.105entrancefee - 0.366travelbus - 1.675train + 0.379vacation + 0.57business + 0.136study + 0.114sport + 0.2seafood - 0.037seatrekking - 0.026nattourism - 0.05cheap + 0.132nature - 0.128qlty\_beach - 0.062nativepeople - 0.089cleanenv + 0.092val\_wildlife + 0.158val\_toursim + 0.077val\_cleanairwater \quad (5.9)$$

$$Ln(VR) = 7.595 - 0.995Ln(TC2) - 3.06e\text{-}06inc - 0.069hhsize + 3.053vne - 0.368gender + 0.22age5 - 0.036professionals - 0.182retired - 0.211highschool + 0.186timeCLC - 0.017timetrip + 0.327homestay - 0.105entrancefee - 0.376travelbus - 1.692train + 0.374vacation + 0.558business + 0.133study + 0.105sport + 0.204seafood - 0.031seatrekking - 0.024nattourism - 0.05cheap + 0.124nature - 0.125qlty\_beach - 0.061nativepeople - 0.089cleanenv + 0.08val\_wildlife + 0.149val\_toursim + 0.067val\_cleanairwater \quad (5.10)$$

The travel costs containing the entrance fee (which was included in the onsite cost) are used in the demand functions to calculate the price elasticities of demand. In this study, the entrance fee is not used as a proxy to estimate price elasticities of demand because the entrance fee[11] is relatively low compared with the total cost of travelling. This result implies that decreasing or increasing the entrance fee may not have any significant impact on visit frequency.

The price elasticity of the zonal travel cost demand model can be calculated using the midpoint method or point method (Baum, 2010). The midpoint method uses the average percent change in both the travel cost and the visitation rate. The point method uses two values (the initial and the new value) of the travel cost and visitation rate to calculate the price elasticity of demand. This study used both

[11] The entrance fee is VND70,000 (US$3.13) per adult per visit. The mean travel costs (TC1 and TC2) are equal to VND 2,629,000 and VND 3,070,000 per person per trip (US$116.8 and US$136.4, respectively).

methods to estimate the price elasticity of the proportion of ***VR*** (demand) against the proportion change of the travel cost (price).

Table 5.10 shows similar results from the two methods (midpoint and point) used to estimate price elasticity (*p-values <0.001*). ***VR***s to the CLC MPA are price inelastic when all variables are chosen at either the mean or median values, identical to previous studies (see Bockstael et al., 1987; McKean, Johnson & Taylor, 2003; Zeybrandt & Barnes, 2001). The elasticity estimates are also identical between the midpoint and point methods. There is very little difference between Models 1 and 2, in the elasticity estimates. The nature of log-transformed demand variable and price means that a 1% change

Table 5.10 Estimates of the travel cost elasticity on recreation demand in the CLC MPA

		Model 1		Model 2	
Method	**Other factors**	**Estimate**	**S.E.**	**Estimate**	**S.E.**
Midpoint	Mean values	-0.927***	0.077	-0.995***	0.084
Point method	Median values	-0.927***	0.077	-0.995***	0.084

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

in the total cost of travelling is negatively associated with approximately 0.927% and 0.995% change in ***VR***s for Models 1 and 2, respectively. An inelastic of travel cost for ***VR*** implies that the change in travel cost is relatively small on the demand for recreation. It suggests that policy makers or authorities may increase the CLC MPA entrance fee to reduce the number of tourists, which has sharply increased in the last five years and also the negative impact on the environment and conservation of the CLC MPA, but total revenue from recreation remains (to partially maintain management and conservation programmes).

5.3 Multi-Destination Trips of Individual Travel Cost Models

5.3.1 Trip Demand Models

TCM models assume that a respondent's trip is for a single purpose or to a only single destination. The travel cost incurred for the trip will be used as a proxy for the price of a respondent's journey to a particular recreational area. However, previous studies have shown that not all respondents are on a single-purpose or single-destination trip (Dewanta, 2011; Loomis, Yorizane, & Larson, 2000; Martínez-Espiñeira & Amoako-Tuffour, 2009; Mendelsohn, Hof, Peterson, & Johnson, 1992; Parsons & Wilson, 1997; Trujillo, Navas, & Vargas, 2017). If respondents made multi-purpose trips or multi-site trips, but their travel costs are considered only to estimate the recreational value for a specific site, then the recreation benefits will be overestimated (Loomis et al., 2000; Martínez-Espiñeira & Amoako-Tuffour, 2008).

This study found that not all respondents are single-site travellers; approximately 95% were involved in multi-site trips. Respondents were asked to list other places they had visited during their journey (that is, apart from the CLC MPA). Four hundred and eighty-three respondents visited the CLC MPA along with a range of other sites, including Hoi An, Da Nang, or the ancient capital of Hue. Some foreign respondents even visited places much further away from the CLC MPA, such as Hanoi or Ho Chi Minh city. Loomis et al. (2000), and Parsons and Wilson (1997) indicate that multi-purpose/multi-destination trips affect the trip demand model and CS. The CS from a fishing trip combined with an incidental trip (such as swimming) is partially lost if the demand model does not capture the incidental trip, which is a part of the recreation trip (Parsons & Wilson, 1997). Similarly, as Loomis et al.'s (2000) study shows, the CS per whale watching trip, estimated using the demand model, excludes multi-purpose trips, leading to an underestimation of total recreation site benefits.

The interaction model, which includes both sole destination and multi-destination trips, should be constructed by adding variable(s) that represent the single-destination of the respondents' trip and respondents' joint consumption in multi-destination trips. The dummy variable for multi-destination trips was designed to recognise the different types of trip (single or multi) respondents took. The dummy variable of interaction between the multi-site trip respondents and their travel costs was designed to capture shifts in travel demands because of joint consumption from all trips to multi-destination trips (Loomis et al., 2000; Parsons & Wilson, 1997). Parsons and Wilson (1997) did not differentiate between single-destination respondents and multi-destination respondents in their empirical models. Hill et al. (2014) and Loomis et al. (2000) improved this work by creating three separate models: single-destination trip, all trip and multi-destination trip models.

Following Hill et al. (2014), three individual demand models were used: the **single-destination trip model** (Model 1)**,** an **all trip model** (Model 2), and the **multi-destination trip model** (Model 3). The travel cost used in these three models was only the cost incurred for travelling (excluding onsite expenses and the opportunity time cost). The exclusion of time costs and onsite costs in the travel cost is controversial and has been debated in many previous studies (e.g., Ezebilo, 2016; González, Marrero, & Navarro-Ibáñez, 2018; Mwebaze & MacLeod, 2013). The CS will be underestimated (or overestimated) because of the overestimation (or underestimation) of travel costs when the time cost and onsite cost are excluded. Thus, separate time cost and onsite cost variables were added to the demand models to control for the effects of time costs and onsite costs (Cesario & Knetsch, 1970; McKean, Johnson, & Walsh, 1995). Adding the time cost variable into the model also aimed to examine the impact of opportunity cost of time on the number of visits to the CLC MPA that respondents made for leisure or other purposes. The correlation between travel cost, time cost, and onsite cost variables were checked to ensure no significant correlation between them.

A count data model is appropriate for this study because the number of visits must be a non-negative integer. Poisson regression and negative binomial regression are two possible options for analysing the trip demand model (with a count dependent variable). Negative binomial regressions are always preferred when over-dispersion appears in the models because the variance of the dependent variable (number of trips) is higher than its mean (A. Cameron & Trivedi, 1986; Hilbe, 2014). This study used Poisson regressions because of the non-appearance of over-dispersion. The over- dispersion test result is lower than one (over-dispersion occurs when dispersion statistic value is higher than one). In this case, Poisson regression is preferable because the negative binomial regression is less appropriate if over-dispersion of data is not evident. In addition, the respondents exclude zero-visit recreationists and the mean of ***visit*** is too low (1.59 and 1.39 for single-destination and multi-destination trips, respectively), which suggests that the zero-truncated Poisson models were then most suitable for the trip demand estimates in this study (Hardin & Hilbe, 2015; Hilbe, 2014).

Table 5.11 Variable descriptions for Models 1, 2 and 3

Variable	Description
visit	Respondent's total number of visits to the CLC MPA in the period of five years
TC00	Total individual cost of travelling ('000 VND)
timecost	Total person opportunity cost of time ('000 VND)
onsitecost	Onsite expense per person (the mid-point of a bracket in '000VND)
timeNAT	Number of hours the respondent spent in nature in the CLC MPA
postgrad	1 = If respondent has a postgraduate degree; 0 = otherwise
rel_visit	1 = If respondent visited relative or friend in the CLC MPA; 0 = otherwise
business	1 = If respondent's visit was for business; 0 = otherwise
occupation	1 = If respondents are freelancer/worker/driver; 0 = otherwise
danang	1 = If respondent visited Da Nang during his/her trip; 0 = otherwise
vne	1 = If respondent is a Vietnamese visitor; 0 = otherwise
MD	1 = If respondent was on a multi-destination trip; 0 = otherwise
MD_tc	= MD * TC00

The three models were analysed separately. Independent variables were added to the models one-by-one until we found the best-fitted models. We also checked for multi-collinearity and heteroskedasticity to ensure the robustness and consistency of the models, as well as the model coefficients. The model specification was also tested to ensure each model was satisfied. Table 5.11 provides definitions for the dependent and independent variables used in the three models. Five independent variables were used in Model 1, 10 predictors were used in Model 2. By adding dummy variables for multi-destination trip respondents, Model 3 contained 12 predictors.

Model 1: Single-Destination Trip

Model 1 included only respondents who indicated that their trip to the CLC MPA was a single-destination trip. The number of respondents decreased from 505 to 22 after screening. This result was not surprising as the CLC MPA is connected to other substitute destinations such as Hoi An and Da Nang, and other popular tourist sites. Visitors who come from far regions and countries often combine several nearby sites, (often considered as bundle goods or services), in their trip. The zero-truncated Poisson function for Model 1 is give in equation (5.11):

$$visit = \exp(\beta_0 + \beta_1 TC00 + \beta_2 timecost + \beta_3 onsitecost + \beta_4 timeNAT + \beta_5 postgrad) \quad (5.11)$$

Model 2: All Destination Trip

Model 2 treats all single-destination trip respondents and multi-destination trips respondents as one. Model 2 had a modified travel cost to consider multi-destination trips, as the costs were shared between destinations. The travel cost for the specific site (the CLC MPA) was determined by dividing total travel costs for the whole trip per site. In the other words, the length of stay at the CLC MPA over the total length of the trip was used as a proxy for the joint travel cost calculation. The all trip demand model is described in equation (5.12):

$$visit = \exp(\beta_0 + \beta_1 TC00 + \beta_2 timecost + \beta_3 onsitecost + \beta_4 timeNAT + \beta_5 postgrad + \beta_6 rel\_visit + \beta_7 business + \beta_8 occupation + \beta_{19} danang + \beta_{10} vne\ ) \quad (5.12)$$

Model 3: Multi-Destination Trip

Model 3 adds two dummy variables into the model to take into account the multi-destination trip. Parsons and Wilson (1997) recommend using a dummy variable to capture shifts in recreation demand associated with multi-destination respondents. Multi-destination trip respondents were distinguished from single-site trip respondents by using the ***MD*** variable. The ***MD*** variable equals one if respondents were on a multi-destination trip and zero if respondents were on a single-destination trip. The interaction between travel cost and multi-destination dummy variable was also added to the model to capture the transition of the demand distribution function from a single-destination to a multi-destination trip (***MD_tc***) (Hill et al., 2014). In this model, the total travel costs were aggregated. The study also considered other control factors related to the shared cost of respondents' multi-destination trips. The formula for the multi-destination demand trip model is described in equation (5.13):

$$visit = \exp(\beta_0 + \beta_1 TC00 + \beta_2 timecost + \beta_3 onsitecost + \beta_4 timeNAT + \beta_5 postgrad + \beta_6 rel\_visit + \beta_7 business + \beta_8 occupation + \beta_9 danang + \beta_{10} vne + \beta_{11} MD + \beta_{12} MD\_tc) \quad (5.13)$$

Table 5.12 provides the summary statistics for all dependent and independent variables in the three models outlined above. Because of the difference in the number of observations in Model 1, similar variables were summarised separately. Two dummy variables related to multi-destination trips were added to Model 3: ***MD*** and ***MD_tc*** (for multi-destination trip respondents and their travel costs, respectively). The ***rel_visit, business, occupation, danang*** and ***vne*** variables were excluded from Model 1 because of collinearity.

As shown in Table 5.12, ***visit*** has a higher mean value in Model 1 than in Models 2 and 3 (1.591 and 1.396, respectively). This means that single-destination trip respondents visited the CLC MPA more frequently than all respondents. These respondents might be locals or live close to the CLC MPA, which means it is easier to travel there. The rest of the variables have higher means in Models 2 and 3 than in Model 1. For instance, the mean of ***timecost*** is 3.5 times higher in Models 2 and 3 than in Model 1 (VND440,742 and VND 125,843, respectively). The mean of travel cost (***TC00***) in Models 2 and 3 is 17 times higher than in Model 1. All respondents spent more on their travelling, their opportunity cost of time and their onsite expenses (***onsitecost***) than single-destination trip respondents did.

Hardin and Hilbe (2015), and Hilbe (2014) contend that robustness of standard errors must be employed in all zero-truncated models. Table 5.13 describes the zero-truncated Poisson models for trip demand with robust standard errors. Table 5.13 shows that all three models are statistically significant at all levels. It also illustrates that the Pseudo r^2 is not significantly different between Models 2 and 3. However, there is a significant difference between Model 1 and the two other models. Though Model 1 has the lowest Pseudo r^2 (26.37%); Model 3 has the highest Pseudo r^2 (29.56%). This is the same as in Hill et al.'s (2014) study.

The additional multi-destination trip variables added to the model were expected to improve the Pseudo r^2 in Model 3, compared with Model 2. However, the Pseudo r^2 in both models are not statistically different (there is less than a 1% difference). Multi-destinations should be considered in the demand model as there may be relevant policy implications. Loomis et al. (2000) found that the CS per visit remains unchanged but that the total benefits of a recreation site are undervalued if multi-destination trips are omitted from the analysis.

Table 5.12 The descriptive statistics of the dependent and independent variables for Models 1, 2 and 3

	Model 1 (n=22)				Model 2 (n=505)				Model 3 (n=505)			
Variable	**Mean**	**S.D.**	**Min**	**Max**	**Mean**	**S.D.**	**Min**	**Max**	**Mean**	**S.D.**	**Min**	**Max**
visit	1.591	0.959	1	4	1.396	0.813	1	4	1.396	0.813	1	4
TC00	57.348	99.871	11.855	500	980.913	1,586.160	7.31	20,250	980.913	1,586.160	7.310	20,250
timecost	125.843	63.328	44.130	212.230	440.742	2,871.372	31.023	63,000	440.742	2,871.372	31.023	63,000
onsitecost	1,238.636	803.553	250	3,000	1,648.020	1,320.998	250	10,000	1,648.020	1,320.998	250	10,000
timeNAT	4.909	4.128	2	14	5.042	3.324	0	14	5.042	3.324	0	14
postgrad	0.045	0.213	0	1	0.089	0.285	0	1	0.089	0.285	0	1
rel_visit					0.933	0.251	0	1	0.933	0.251	0	1
business					0.020	0.139	0	1	0.020	0.139	0	1
occupation					0.048	0.213	0	1	0.048	0.213	0	1
danang					0.685	0.465	0	1	0.685	0.465	0	1
vne					0.846	0.362	0	1	0.846	0.362	0	1
MD									0.956	0.204	0	1
MD_tc									978.414	1587.529	0	20,250

Table 5.13 Zero-truncated Poisson trip demand models

Variable	Model 1	Model 2	Model 3
TC00	0.00318*	-0.000409***	0.00212***
	(0.00166)	(0.000147)	(0.000549)
timecost	-0.00801	0.000198***	0.000202***
	(0.00789)	(4.80e-05)	(4.86e-05)
onsitecost	0.000282	0.000111*	0.000118**
	(0.000277)	(5.82e-05)	(5.72e-05)
timeNAT	-0.252	-0.0452*	-0.0461*
	(0.190)	(0.0259)	(0.0258)
postgrad	-10.53***	0.923***	0.917***
	(2.414)	(0.225)	(0.225)
rel_visit		0.997***	0.966***
		(0.251)	(0.257)
business		1.027***	1.027***
		(0.177)	(0.177)
occupation		0.978***	0.957***
		(0.280)	(0.280)
danang		-0.460***	-0.494***
		(0.168)	(0.174)
vne		2.361**	2.386**
		(0.999)	(1.005)
MD			0.367
			(0.291)
MD_tc			-0.00254***
			(0.000574)
Constant	0.996	-2.362**	-2.721**
	(1.059)	(1.003)	(1.072)
Observations	22	505	505
Pseudo r-squared	0.2637	0.2938	0.2956
Chi-square	218.16	397.85	434.42
Prob > chi2	0.000	0.000	0.000
Akaike crit. (AIC)	49.332	735.135	737.332
Bayesian crit. (BIC)	55.878	781.605	792.251

Robust standard errors in parentheses
*** *p<0.01*, ** *p<0.05*, * *p<0.1*

The econometric results in Table 5.13 also show that the respondents' demographic variables (***postgrad*** and ***occupation***) are statistically significant in all models (*p <0.01*). However, the influence of ***postgrad*** on the number of visit is opposite when Model 1 is compared with Models 2 and 3. The ***postgrad*** coefficient changes its sign from negative in Model 1 to positive in Models 2 and 3, which means that it negatively affects the number of visits for single-destination trip respondents. Higher education is associated with decreased visits to the CLC MPA in single-destination trip respondents. In contrast, postgraduate respondents on all trip or multi-destination trips visit the CLC MPA more frequently. Like ***postgrad***, respondents' occupation (***occupation***) has a positive effect on respondents' visits in Models 2 and 3, but only because there are no observations in Model 1. This means that if respondents are freelancers, labourers, or drivers, they visit the CLC MPA more frequently than respondents in other occupations.

Respondents' citizenship or race (***vne***) has a significant, positive effect on the total number of visits they make in Models 2 and 3 ($p<0.05$). If respondents are Vietnamese, their number of visits to the CLC MPA increase. If they are foreigners, their visit frequency decreases. The ***vne*** variable is omitted in Model 1 because of collinearity (100% of single-destination trip respondents are Vietnamese).

Respondents' time spent in CLC MPA nature (***timeNAT***) has a significant negative impact on their visits ($p<0.1$) in Models 2 and 3. This variable is not statistically significant in Model 1. In short, respondents' trips decrease if they spend more time in nature at the CLC MPA. The ***timeNAT*** coefficient values vary between the three models. Though they are mostly identical in Models 2 and 3, it is approximately one sixth in Model 1. It is likely that the respondents benefited less when they spent longer in nature in CLC MPA, which implies the respondents visit the CLC MPA less. Perhaps they have had to reduce and share their own benefit with others because of the sharp increase in the number of visitors (as indicated in Ngoc, 2018) at the recreation site. Another reason might be that the nature value of the CLC MPA does not benefit the respondents as much as they expect.

Two variables of respondents' purpose to visit CLC MPA were included in the trip demand models (***business,*** and ***rel_visit***) to investigate which purpose will encourage further visits. The results in Table 5.13 show that they were both omitted from Model 1 (because of collinearity). They were statistically significant at 1% in both Models 2 and 3. The ***business*** and ***rel_visit*** variables positively influence all respondents' visits. In short, the number of trips increases when respondents travel to the CLC MPA for work or to see their relatives or friends who live or work on the CLC MPA island.

Visiting a nearby place, other than the CLC MPA, within the respondents' trip negatively influences their decision to visit the CLC MPA. The ***danang*** variable is significant and negatively impacts the number of trips respondents make to the CLC MPA (at 1% significance in Models 2 and 3). This finding indicates that if respondents visit Da Nang (approximately 30 km away from the CLC MPA) during their whole trip, their number of visits to the CLC MPA reduces. Further study should investigate if other nearby sites, such as Da Nang, can become substitute sites for multi-destination trip respondents if the CLC MPA entrance fees increase or the quality of this site declines. Other than that, nearby sites, including the CLC MPA should be considered as a bundle of goods or services for respondents' trips in the demand estimate to solve the problem of multi-destinations in the demand model.

Unlike previous studies (e.g., Hill et al., 2014; Loomis et al., 2000), the ***TC00*** coefficient in the multi-destination trip model is statistically significant (at 1%), but not negative which means that the CS for single-destination trip respondents in Model 3 cannot be estimated. Similarly, the ***TC00*** coefficient in Model 1 is positive and statistically significant (at 10%), indicating that the CS of single-destination trip respondents cannot be obtained in Model 1. In this study we cannot compare the CS per trip for single-destination trip respondents for Models 1 and 3 (an estimation suggested by Hill et al., 2014). As a proxy of price, ***TC00*** is negative and significant in Model 2 ($p<0.01$). This is consistent with previous travel cost studies (e.g., Amoako-Tuffour & Martínez-Espiñeira, 2012; Ha, 2007; McKean et al., 2003; Tapsuwan & Asafu-Adjaye, 2008; Trujillo et al., 2017). A proxy of price in Model 3 is demonstrated using a combination of travel cost and dummy travel cost of multi-destination trip respondents (as recommended by Loomis et al., 2000; McConnell & Strand, 1981), because of the correlation between these two variables. This combined price also has a negative effect on the number of trips in Model 3. The greater the cost incurred when travelling to the CLC MPA, the less respondents tend to visit, regardless of whether the respondents are on all-purpose trips or multi-destination trips. The CS in Model 3 is calculated using a combination of coefficients from two travel cost variables.

Though two cost related variables (***timecost*** and ***onsitecost***) are not statistically significant in Model 1, they are statistically significant in Models 2 and 3. The ***timecost*** variable is positive and statistically significant with *p-values* <0.01 in both models. Meanwhile, the ***onsitecost*** is positive and significant with *p-values* <0.1 and <0.05 in Models 2 and 3, respectively. Their coefficients are identical in Models 2 and 3. The coefficients of ***timecost*** and ***onsitecost*** are both positive in Models 2 and 3, which means the number of visits always increases with an increase in the opportunity cost of time and expenses incurred onsite regardless of whether the respondents are on multi-destination trips or all-purpose trips. This is consistent with the truncated Poisson model in McKean et al.'s (1995) study, which shows that the time cost variable has a positive coefficient. When the time cost variable is separated from the travel cost variable, and positively affects the trip demand model, respondents' travel and onsite time might be considered a first stage of planning their trip. In other words, a further and longer trip is considered first when the respondents plan for their trip. In contrast, Bockstael et al. (1987) suggest that if the estimate of the time cost variable coefficient is positive, then the total travel cost should be negative in line with the demand model of travel cost. In this case, the time cost variable should be added to the travel cost as one variable, *in situ* the coefficient of combination variable is expected to be negative.

In general, both Models 2 and 3 show identical effects (positive or negative) from significant determinants on the number of trips that the respondents made to the CLC MPA, except for the ***TC00*** variable. The intensity of the impact is slightly different for some variables; it depends on the variable coefficient values. Model 3 considers the multi-destination trip using two additional variables. ***MD*** and

MD_tc were added to test the impact of a multi-destination trip on the demand model. Only ***MD_tc*** is statistically significant, with *p-values* smaller than 0.01. The ***MD_tc*** coefficient is negative in Model 3, which is similar to previous studies (e.g., Hill et al., 2014; Loomis et al., 2000; Martínez-Espiñeira & Amoako-Tuffour, 2009; Parsons & Wilson, 1997). This result indicates that the greater the travel costs for a multi-destination trip, the fewer visits respondents are likely to make.

5.3.2 Consumer Surplus

This study examines how the CS is affected in different trip demand models by comparing Models 2 and 3. Previous studies (Hill et al., 2014; Loomis et al., 2000; Martínez-Espiñeira & Amoako-Tuffour, 2009; Parsons & Wilson, 1997) show that if the multi-purpose trip was omitted from the demand model, the CS would be overestimated. The omission of multi-destination trip analysis in the demand models may explain the difference in CS between the multi-destination demand model and the regular demand model (in this study, between Models 3 and 2). In sum, we use the multi-destination trip demand model rather than the normal demand model to avoid CS estimation biases.

The CS was calculated using the coefficient of travel cost with the assumption that the sign of travel cost coefficient would be negative (Creel & Loomis, 1990) (Equation (3.9)). The CS for single-destination or all-purpose trips is defined as:

$$CS = -\frac{1}{\beta_1} \qquad (5.14)$$

Where β_1 elicited from equations (5.11) and (5.12) was used to estimated CS for single-destination or all-purpose trips, respectively.
In the multi-destination trip model, CS_{MD} is defined in the following way (see equation (5.15), using β_1 and β_{12} from equation (5.13) because of the correlation between travel cost variables (Hill et al., 2014; Loomis et al., 2000).

$$CS_{MD} = -\frac{1}{(\beta_1 + \beta_{12})} \qquad (5.15)$$

The ***TC00*** coefficient is significant but positive in Models 1 and 3, meaning that the CS for a single-destination trip cannot be calculated. The CS values for the all-purpose and multi-destination trip in Models 2 and 3 are displayed in Table 5.14.

Table 5.14 indicates that there is a slight difference between CS estimates in the two models. The CS for the all-purpose trip is VND2,445,000 or US$109.2 per person per trip. When the multi-destination dummy variables and its travel cost interaction are added into the trip demand model (Model 3), the CS decreased by VND64,000 (US$2.9) or approximately 2.7%. The CS per person per day (second row, Table 5.14) was calculated by dividing the CS per person per trip with the mean value of total time that the respondents spent in the CLC MPA (1.49 days). The results in Table 5.14 indicate that the multi-destination trip slightly affects the demand model. In the all-purpose trip model, benefits are somewhat overestimated. This finding is identical with previous studies (Dewanta, 2011; Loomis et al., 2000) that found that per person, per trip CS estimated using the multi-destination trip demand model is lower than that of the all respondents demand model. Even if the CS is equal in Models 2 and 3, the multi-destination variable should be included in the demand model if the respondents are on multi-destination trip.

Table 5.14 Consumer surplus of trip demand

	All-purpose	**Multi-destination**
CS per person per trip	VND2,445,000 US$109.2[12]	VND2,381,000 US$106.3
CS per person per day	VND1,641,000 US$73.3	VND 1,598,000 US$71.3

As Loomis et al. (2000) note, even if the CS is not significantly different between the two models (2 and 3), multi-destination trips should be considered in the demand model and benefit estimates because these will affect the total benefits of the recreation site. For the CLC MPA, visitors made over 399,000 trips in 2018 (Nguyen, 2019) which means that they generated total benefit of approximately VND975 billion (US$43.6 million) from recreation values. However, the total benefit decreased by VND25 billion (or US$1.2 million) when multi-destination trips were included in the demand model (total benefit equals VND950 billion or US$42.4 million). In sum, the total benefit of recreation sites may be overestimated if multi-destination trips are omitted from the demand estimates.

5.4 Summary

This chapter discussed the calculations and analysis of the TCM empirical models. In this chapter, the ZTCM models were used to investigate the determining factors affecting respondents' visitation rates from 20 different domestic and international zones. The results show that the respondents' travel costs (***TC1*** and ***TC2***), the period of time the respondents spent for the whole trip (***timetrip***), respondents' socio-economic characteristics (***hhsize, gender, highschool*** and ***inc***), respondents' transport means (***travelbus*** and ***train***), and respondents' evaluation of the CLC MPA quality (***qlty_beach***) are negative and statistically significant. The respondents' reason for visiting the CLC MPA (***business***), time spent at the CLC MPA (***timeCLC***), accommodation while visiting the CLC MPA (***homestay***), and race (***vne***: Vietnamese respondents) are positive and statistically significant in terms of their impact on visitation rates. The price elasticity of the zonal demand model to changes in the travel cost has also been

[12] *The exchange is applied at the time of survey US$1=VND 22,400*

estimated. If the mean values of other factors are applied, the demand function is inelastic regardless of the midpoint or point method being used.

This chapter also analysed the bias of CS when omitting the multi-purpose trip from the trip demand model. As some variables representing multi-purpose trips were added into the demand model, the CS per person per day decreased by 2.7%. However, the multi-destination variable should not be omitted from the demand model even if the difference in CS is small because it will bias the total benefits of recreation values.

TCM was used to estimate the recreational values of the CLC MPA and evaluate other related issues in the demand models. The recreational values are used values, with their own market and price. Respondents must pay a certain price (revealed through their travel cost) for their recreational benefits in the CLC MPA. However, the CLC MPA not only has use-values (e.g., recreation), but also non-use values (including conservation). An estimate of the conservation values requires stated preferences from the respondents about what should be preserved for future generations. The next chapter discusses the CVM used to estimate the conservation value of the CLC MPA, that is, the respondents' WTP for conservation.

Chapter 6

Willingness to Pay for Conservation – Results and Discussion

6.1 Introduction

This chapter describes the use of CVM to elicit the WTP for conservation in the CLC MPA. Two WTP techniques were used, but only data collected from the payment card format were used to analyse the influence of respondents' socio-characteristics and environmental perceptions on their WTP for conservation in the CLC MPA. The DBDC was not used in this study because of a lack of bid values for model analysis and WTP estimation.

The chapter is organised as follows: Section 6.2 summarises and discusses the reasons that respondents were/were not willing to pay for conservation in the CLC MPA (paying an additional entrance fee), including the recognition of protest bidders. The chapter also summarises and discusses respondents' perceptions of conservation and environmental protection. Section 6.3 introduces the three WTP models used to investigate the statistically significant factors affecting respondents' WTP for conservation in the CLC MPA. Section 6.4 provides the WTP estimates for three different groups of respondents (combined, Vietnamese and foreign visitors). This section investigates why there are significant differences between the WTP estimates for these three groups. This section also estimates the total revenue from tourism in the CLC MPA using six projections based on two entrance fee levels (the current and proposed value) for a period of 10 years (2019 – 2028). Section 6.5 summarises the chapter's findings.

6.2 Descriptive Analysis

The revealed preference methods, including the TCM, can only estimate the use value. They cannot measure the non-use value (existence value) of environmental and nature resources. In contrast, stated preference methods can measure non-use values, which include the conservation and preservation of the environment and natural resources. Moreover, stated preference methods can be used to provide support for new proposed government policies that are based on respondents' preferences for improving the habitat and environmental quality (Hall et al., 2002).

The CVM is a stated preference method (Freeman, 1993; Willis & Garrod, 2012). It is used in this study to investigate whether respondents are willing to pay for conservation efforts when they visit the CLC MPA, and to determine their maximum WTP. The purpose of this study is to estimate the existence value of the CLC MPA for future generations, using the present generation's conservation contribution.

Respondents are both international and Vietnamese visitors. The two groups were analysed separately and then combined. The purpose of this was to test whether foreign respondents were willing to pay a higher conservation fee than Vietnamese respondents.

The CVM often uses tax increase questions to elicit information about respondents' WTP (WTA) any change in environmental goods (e.g., Hall et al., 2002). However, this approach is not appropriate for analysing increases in the CLC MPA conservation tax or levy. The additional charge (added to the entrance fee) was used as a payment vehicle for non-use benefits. Before asking the respondents about their WTP for an additional entrance fee to support conservation, respondents were given information about the current rate (VND70,000 or US$3.13 in 2018). They were also asked to rate the current entrance fee on a scale that ranged from very cheap to very expensive. Most respondents indicated that the current entrance fee was affordable (67.72%). The proportion of respondents who chose "very cheap" and "expensive" were similar (7.33% and 8.32%, respectively). Only one respondent thought that the current entrance fee was very expensive (s/he accounted for 0.2%). Table 6.1 shows respondents' (the combined group) assessment of the current CLC MPA entrance fee. In short, over 90% of the respondents agreed that the current entrance fee was reasonable.

Table 6.1 Current entrance fee assessment

Category	Frequency	Percentage
Very cheap	37	7.33
Cheap	83	16.44
Affordable	342	67.72
Expensive	42	8.32
Very expensive	1	0.2

Respondents were asked a yes/no question whether they were willing to pay extra (a positive amount) for conservation efforts in the CLC MPA. In a payment card format, the respondents who answered yes were then asked to state their WTP values from the provided list of bids. In the 505 sampled respondents, 66.34% were willing to pay more (a positive amount) to support conservation efforts ("yes" respondents). These respondents included the ones who rated the current entrance fee as very cheap (10.15%), those who indicated it was cheap (20.9%), and those who indicated it was affordable (67.76%). Only 1.19% of the "yes" respondents, who thought that the current entrance fee was expensive, were willing to pay extra for conservation efforts.

The "yes" respondents were provided with a list of WTP motivations to validate of their positive bids (Goodman et al., 1998). This was measured using a Likert scale ranging from one to five (from strong disagreement to the strong agreement). As displayed in Table 6.2, the contribution for CLC MPA's conservation (preservation) and environmental quality improvement were the reasons that received the highest mean values at 4.37 and 4.23, respectively. The results indicate that the "yes" respondents are aware of their conservation contribution for the CLC MPA's environment and natural resources. The "yes" respondents also expressed their interest in the CLC MPA recreation area; they indicated that they would be happy to pay more to use it (mean 4.16). The reason "the entrance fee to the CLC MPA is lower than that of other MPAs and coastal recreational sites" had the lowest mean (3.39). It seems that the cheap entrance fee was unlikely to be the reason why the respondents wanted to contribute more.

Table 6.2 Respondents' motivations for their WTP for conservation of the CLC MPA

WTP motivation	Obs.	Median	Mean	S.D.	Min	Max
Conserve and preserve the CLC MPA for future generation	326	5	4.37	0.75	1	5
Want better facilities	325	3	3.48	1.03	1	5
Get satisfaction from having paid to help preserve the MPA	321	4	3.99	0.88	1	5
Improve environmental quality in the CLC MPA	324	4	4.23	0.87	1	5
Want to pay more for CLC MPA management and for using recreational areas	323	4	4.16	0.82	1	5
The entrance fee to the CLC MPA is lower than that of other MPAs and coastal recreational sites	321	3	3.39	1.04	1	5
Want to contribute to local development	324	3	3.54	0.99	1	5
The CLC MPA beauty deserves to be paid more for enjoying it	324	4	3.97	0.88	1	5
Do not think much about my motivation for WTP	325	3	3.97	0.93	1	5

Among the "no" respondents, the highest number (84) chose the fifth reason for not paying more (a positive amount) or an additional fee (see Table 6.3). This result suggests that these respondents did not believe the money would be used for conservation. In other words, it is likely that a lack of transparency in using funds by government agencies or authorities leads to the respondents' distrust in these organisations' funds management. This is the same in other developing countries where public organisation funds are often misused. For example, surveyed divers in the coral reefs in Anilao, Mactan Island and Alona beach in the Philippines preferred that non-government organisations manage their fees, instead of government organisations (Arin & Kramer, 2002). Similarly, a number of surveyed respondents in China (19.7% of "no" respondents) were unwilling to pay for biodiversity conservation and environmental protection in the Dalai Lake protected area because they do not trust that their money would be used for these purposes (Wang & Jia, 2012). Yeo (2005) reveals most respondents (91%) in study were willing to pay an entrance fee to visit the Pulau Payar Marine Park in Malaysia, but only if their contribution were used for management improvement in the park.

A similar number of "no" respondents chose the first reason for not paying an extra amount of money for marine conservation (Table 6.3). This reflects current debates around the property rights of natural resources, especially marine and coastal resources. Hall et al. (2002) state that if respondents think resources are public goods, then the government should be responsible for maintaining the quality of them. Wang and Jia (2012) contend that socio-political factors explain why some Chinese respondents were unwilling to pay an entrance fee. For example, the authors believe that respondents have very little awareness of how to resolve environmental problems or, when they were aware of environmental issues, they believed it was the government's responsibility. Moreover, the "no" respondents may give zero/protest bids because they believe that someone or another party causes the degradation or depletion and thus should pay for it. A small number of respondents refused to pay extra because they stated that they would not be able to afford the additional cost. Generally, most of the respondents could afford the current entrance fee to visit the CLC MPA.

Table 6.3 Reasons for unwillingness to pay for the conservation of the CLC MPA

	Reason	Number of selection
1	The MPA already has funds for a conservation programme from the government, non-government organisations and/or donors	84
2	I do not care about the conservation programme of the CLC MPA	33
3	Polluters and fishermen should pay for the CLC MPA conservation programme	14
4	It costs too much to visit the CLC MPA	27
5	Don't trust that money will be used appropriately	84
6	I am too poor	7
7	Not tourists' responsibility	30
8	Not enough information	28
9	Other	7

A major proportion of the respondents (33.66%) were not willing to pay an additional entrance fee, suggesting that there were perhaps some protest bidders among the "no" respondents. Protest bidders were considered those respondents who chose one of the following reasons: "The MPA already has a fund for conservation", "Polluters or fishermen should pay for conservation" or "Not tourists' responsibility" (see Table 6.3) (Ghosh & Mondal, 2013). The results from the survey showed that there were some protest bidders. Of the 111 respondents, 65.29% of "no" respondents or 21.98% of the total respondents chose one, two or all three of the above reasons to explain why they would not pay an additional amount. These respondents were excluded from the WTP model, because they would cause a downward bias in the WTP estimates (Hackl & Pruckner, 1999). Thus, after eliminating protest bidders, the usable observations decreased from 505 to 394.

Protest bidders are popular in CVM surveys (Asafu-Adjaye & Tapsuwan, 2008; Kerr, 2001; Wang & Jia, 2012). Other protest responses may include ones who bid the value of goods or services with a price not included in the list (invalid bids). Others may assign a zero value to the goods and services that they agree to pay for (a positive bid) (Ghosh & Mondal, 2013). In our survey, no observations were rejected for these two reasons. The "no" respondents who were not protest bidders, were considered valid zero bidders (Goodman et al., 1998).

In the payment card format, “yes” respondents were provided with a series of bids. In this study, a series of 10 (positive) WTP bidding values were provided for the “yes” respondents. Their chosen bid is considered the amount they are willing to pay for conservation in the CLC MPA.

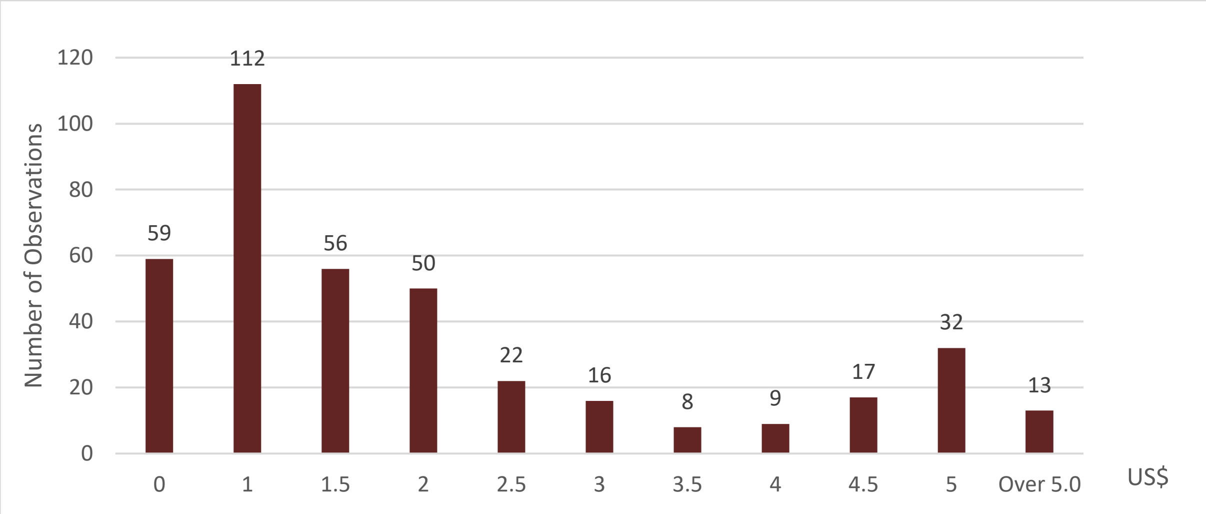

Figure 6.1 A histogram of bidding frequency of all respondents

Figure 6.1 illustrates the respondents’ bidding preferences, including a zero payment, for the CLC MPA conservation fund. The greatest number of respondents chose to pay an additional US$1.0 (112 of 394 respondents; 28.43%). Next are zero and US$1.5 payment bidders (59 and 56, or 14.97% and 14.21%, respectively). Thirteen respondents (3.3%) chose the highest offer (over US$5.0) for the CLC MPA conservation fund. Generally, in the bidding game, the higher the bidding value, the fewer the number of respondents. However, that was not so in this case. The least number of respondents (eight or 2.03%) were willing to pay US$3.5, which is four times less than the number of respondents (32 or 8.12%) who chose the higher value of US$5.0.

The combined respondents’ bids are skewed to the left. This result shows a descending trend in ascending order of bid value. The trends differed for domestic and foreign respondents. In Figure 6.2, the blue line (Vietnamese respondents) shows a downward trend and is skewed to the left; in contrast, the red line (foreign respondents) tends to go upwards and is skewed to the right. Higher offers were associated more with overseas respondents. Over a third (34.15%) of Vietnamese respondents chose a US$1.0 bid, which is remarkably higher than the foreign respondents (1.45%). However, only 1.54% of Vietnamese respondents chose the highest offer of over US$5.0; nearly 12% of foreign respondents chose this bid value.

As previously discussed, foreign respondents are presumably able to pay more because of their higher incomes and have a greater awareness of environmental issues, compared with domestic respondents (further details are provided in the following of this section). However, though international respondents seemed happier to pay more for conservation in the CLC MPA, a large number of them (21.74%) bid nothing for conservation; this figure is much higher than the number of domestic respondents (13.54%) who bid nothing. Over 50% of the zero bid foreign respondents chose "not enough information" as their main reason for not paying. Some explained to the interviewers that they did not understand the phrase "additional fee": they did not wish to pay for any other charges or fees (apart from their entrance fee) for their trip to the CLC MPA. However, they were willing to pay a higher entrance fee to ensure they contributed to the conservation efforts in the CLC MPA if required. Further study should consider the wording on any signage or information guides to ensure that respondents fully understand what they are paying for.

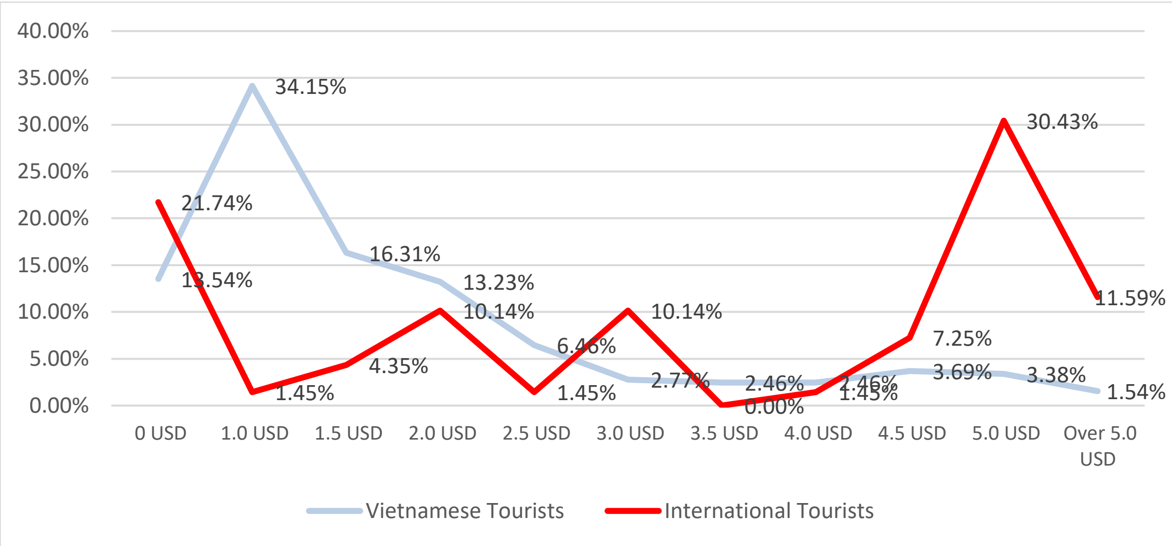

Figure 6.2 Bidding preferences of Vietnamese and foreign respondents

In sum, 85% of the valid surveyed respondents were willing to pay a positive amount for conservation in the CLC MPA. This includes 78% of foreign respondents and 87% of Vietnamese respondents. This result is identical with Lindsey and Holmes' (2002) study (72% and 83%, respectively) that investigated the WTP for the Hon Mun MPA in Vietnam. It is likely that more Vietnamese respondents want to contribute to MPA conservation in Vietnam than foreign respondents. Similarly, Tapsuwan's (2005) study also found that more Thai visitors were willing to pay a positive amount for conservation than foreign visitors (45.67% and 34.56%, respectively) while scuba diving in the Mu Ko Similan Marine National Park, Thailand.

The survey includes other questions, such as the perceptions of environmental protection and conservation, sustainable practices, and participation in environmental protection activities. These questions were included to investigate respondents' perceptions of/attitudes towards environmental protection and conservation. Among the 394 respondents, nearly 44% had participated in environmental protection activities (either local or international). Forty-seven percent of Vietnamese respondents and 29% of foreign respondents were involved in these activities. The survey also investigated respondents' levels of knowledge on sustainable practices. Table 6.4 reveals that more foreign respondents proactively explore knowledge on sustainable practices compared with Vietnamese respondents (28.99% and 20.25%, respectively). In sum, over 76% of foreign respondents understand or are involved in sustainable practices; for Vietnamese respondents, the figure is 64.17%. Four Vietnamese respondents did not mention their sustainable practical activity.

Table 6.4 Respondents' perception of sustainable practices

Perception	Vietnamese respondents (n=321)		Foreign respondents (n=69)	
	Frequency	%	Frequency	%
Not full understanding of sustainable practices	115	35.83	16	23.19
Recognising sustainable practices on the news or mainstream media	141	43.93	33	47.83
Seeking information on sustainable practices (e.g., environmental or social concerns)	65	20.25	20	28.99

Respondents were also asked to state their views on the most important activities that should be undertaken to harmonise natural resource conservation and environmental protection, and local development using a five-point Likert scale (1 equals the least important and 5 equals the most important). Table 6.5 shows that the respondents agreed that these concerns were somewhat important. All respondents agreed that environmental management and marine biodiversity conservation in the CLC MPA would succeed if local people participate in the activities. They also highly agreed that natural resource conservation and other environmental concerns should be improved. However, the degree of agreement varied between Vietnamese and foreign respondents. In general, foreign respondents gave higher points for the importance of harmonising conservation, environmental protection activities and local development in the CLC MPA, than Vietnamese respondents. The mean values in Table 6.5 indicate that foreign respondents gave lower ratings for increasing eco-inspections and law enforcement, and stopping new tourism facilities and port construction, compared with Vietnamese respondents. However, the differences between the means are nominal. The biggest gap relates to banning fishing around the island (the CLC MPA). There is nearly a one-point difference in the means (4.062 and 3.159) between Vietnamese and foreign respondents, respectively. It is also worth mentioning that Vietnamese respondents gave the lowest point and foreign respondents gave the second lowest point for increasing the entrance fee to improve conservation and environmental protection in the CLC MPA. It is likely that all respondents did not strongly agree that increasing the entrance fee would solve concerns about harmonising development and conservation.

Table 6.5 Respondents' perceptions of important activities to harmonise conservation/environmental protection and local development in the CLC MPA

Statement	Combined respondents (n=394)		Vietnamese respondents (n=325)		Foreign respondents (n=69)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Improve waste collection and management	4.195	0.826	4.119	0.825	4.554	0.737
Improve protection and conservation of marine and terrestrial biodiversity	4.202	0.915	4.112	0.933	4.626	0.686
Improve water sewage treatment	3.977	0.966	3.88	0.997	4.435	0.63
Improve sand excavation management	3.842	1.008	3.816	1.037	3.966	0.857
Increase eco-inspection and other forms of law enforcement	4.201	0.908	4.206	0.924	4.18	0.839
Increase local people participation in local environmental management and marine biodiversity conservation	4.25	0.7	4.192	0.701	4.522	0.633
Enhance eco-education for tourists	4.077	0.856	4.013	0.853	4.377	0.806
Fishing should be banned around the islands	3.904	0.971	4.062	0.873	3.159	1.066
New tourism facilities and new ports construction should be stopped	3.943	1.022	3.95	1.017	3.913	1.054
Increase entrance fee to help improve conservation and environmental protection	3.508	0.985	3.474	0.99	3.667	0.95

6.3 Empirical Model Discussion

The respondents' WTP for conservation in the CLC MPA was first determined using a binary question "*Would you be willing to pay an "additional" entrance fee, other than current entrance fee, each time you visit and use the CLC MPA to contribute to MPA management and conservation programmes*?". Those who indicated that they would pay a positive amount (those who ticked "yes") were then asked to choose the amount they would be willing to pay. Respondents were provided with a list of ten bidding values in ascending order (US$1.0, US$1.5, US$2.0, US$2.5, US$3.0, US$3.5, US$4.0, US$4.5, US$5.0, and over US$5.0).

As discussed in Chapter 3 (see section 3.3.1), respondents' WTP values were treated as intervals, instead of points (T. Cameron & Huppert, 1989; Hackl & Pruckner, 1999; Mahieu et al., 2012), because the WTP values are censored with the respondents' chosen bid value. This means that respondents' true WTP may be beyond their stated bid value (right censored boundary) or below their stated bid value (left censored boundary). The benefit estimates from the WTP may be overestimated or underestimated if the respondents' true WTP is right censoring or left censoring with the respondents' stated bid (Mahieu et al., 2012). Hence, respondents' bid values represent the interval in which their true WTP falls. In other words, their bid value will be the lower bound of their true WTP. The next highest bid value will be the higher bound of their true WTP. For instance, if a respondent chooses a bid of US$1.0, it is assumed that his or her true WTP is equal to or greater than US$1.0, but less than US$1.5 (the next highest bid value) (T. Cameron & Huppert, 1989).

Table 6.6 Frequency and proportion of WTP interval selection

Interval bid (US$)	Combined		Vietnamese respondents		Foreign respondents	
	Frequency	%	Frequency	%	Frequency	%
0 – 1.0	59	14.97	44	13.54	15	21.74
1.0 – 1.5	112	28.43	111	34.15	1	1.45
1.5 – 2.0	56	14.21	53	16.31	3	4.35
2.0 – 2.5	50	12.69	43	13.23	7	10.14
2.5 – 3.0	22	5.58	21	6.46	1	1.45
3.0 – 3.5	16	4.06	9	2.77	7	10.14
3.5 – 4.0	8	2.03	8	2.46	0	0
4.0 – 4.5	9	2.28	8	2.46	1	1.45
4.5 – 5.0	17	4.31	12	3.69	5	7.25
5.0 – 5.5*	32	8.12	11	3.38	21	30.43
5.5 + **	13	3.3	5	1.54	8	11.59

**Respondents who chose a US$ 5.0 bid had a higher bound WTP of US$5.5.*
*** Respondents who chose a bid over US$5.0 were assumed to have a lower bound WTP of US$5.5*

Following T. Cameron and Huppert (1989), Table 6.6 presents the respondents' WTP for conservation in the CLC MPA, in intervals, for the three different groups: combined, Vietnamese and foreign respondents. These intervals were treated for further analysis to elicit WTP estimates.

The survey produced 394 valid observations which were used for econometric analysis. Table 6.7 describes all the variables used in the WTP models. Among the nine independent variables, four variables are dummy (***manager, secondary, env_act,*** and ***valueCLC***) and four other variables (***qlty_beach, ef_rating, eco_edu,*** and ***ef_increase***) were in the form of Likert scales (1 to 5). The ***inc*** independent variable and the ***WTP*** dependent variable are in U.S. dollars. The non-parametric mean WTP results show that there is a difference between the two groups (Vietnamese and foreign respondents). The *t-test* result indicates that the difference is statistically significant at $p<0.001$.

In this study, Likert scales were used to measure respondents' perceptions of the conservation of natural resources and environmental protection, their attitudes on the quality of nature, and the entrance fee. Clemes, Gan and Zhang (2010), and Sriwaranun, Gan, Lee and Cohen (2015) indicate that using a Likert scale is popular and undisputed in social science research. As long as the Likert scale responses are distributed normally, they can be treated as continuous predictors (Owuor, 2001).

Table 6.7 Definitions and descriptive statistics for all variables used in the empirical models

Variable	Description	Combined respondents (n=394)		Vietnamese respondents (n=325)		Foreign respondents (n=69)	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
WTP	Willingness to pay for additional entrance fee per visit to CLC MPA – dependent variable	2.244	1.543	1.984	1.286	3.471	2.009
inc	Monthly individual income (US$)	682.4	1,257	274.3	94.2	2,604.7	2,131.5
ef_rating	The rate of entrance fee. 1 = very cheap; 5 = very expensive	2.657	0.700	2.772	0.606	2.116	0.850
manager	1 = If respondents are manager, owner of business or self-employed; 0 = otherwise	0.239	0.427	0.246	0.431	0.203	0.405
secondary	1 = If respondent's highest education is secondary school; 0 = otherwise	0.030	0.172	0.034	0.181	0.014	0.120
qlty_beach	Respondents' assessment on quality of CLC MPA beaches (1 = very poor; 5 = very good)	4.224	0.723	4.247	0.706	4.119	0.796
env_act	1= If respondents participate in environmental protection activities; 0 = otherwise	0.439	0.497	0.471	0.500	0.290	0.457
valueCLC	1 = if jobs and foreign exchange are the most important value provided by the CLC MPA; 0 = otherwise	0.005	0.071	0.003	0.055	0.014	0.120
ef_increase	Increasing the entrance fee to help improve conservation and environmental protection in the CLC MPA (1 = less important; 5 = most important)	3.508	0.985	3.474	0.990	3.667	0.950
eco_edu	Enhancing eco-education for tourists (1 = less important; 5 = most important)	4.077	0.856	4.013	0.853	4.377	0.806

The probability of respondents' WTP an additional entrance fee to visit the CLC MPA was modelled as a function of respondents' characteristics, their perceptions of environmental protection and conservation, as well as their attitudes toward the entrance fee and the quality of nature in the CLC MPA. To investigate the influence of the independent variables on the dependent variable, the respondents' WTP, we conducted a lognormal regression. The natural logarithm function of their WTP was used because it captured the skewness of WTP values in its distribution and avoided the prediction of negative WTP amounts (Togridou, Hovardas, & Pantis, 2006).

A bidirectional elimination approach was used to include significant variables and exclude irrelevant variables from the models. Generalised Linear Models (with log normal distribution and Gamma family) in Stata 16.0 were used to determine the model fit. The models' coefficient values, robust standard errors and marginal effects are reported in Table 6.8. The marginal effect is measured at the mean of predictor variables in which continuous variables are measured by calculus methods. Dummy variables are measured by finite-difference methods (A. Cameron & Trivedi, 2010). In other words, the marginal effect varies with the point of evaluation of predicted values of continuous regressors. Meanwhile, the marginal effect of the dummy variable is the change in the conditional mean when the dummy variable changes from 0 to 1 (A. Cameron & Trivedi, 2010). Equation (6.1) expresses the natural log-link function for the WTP used in this study:

$$Log(WTP) = \beta_0 + \beta_1 inc + \beta_2 ef\_rating + \beta_3 manager + \beta_4 secondary + \beta_5 qlty\_beach + \beta_6 env\_act + B_7 valueCLC + \beta_8 ef\_increase + \beta_9 eco\_edu \quad (6.1)$$

Table 6.8 gives the maximum likelihood estimates for the three CVM models assessing the WTP for the biodiversity conservation in the CLC MPA. These models were run separately with different observation samples. **Model 1** analysed combined respondents' (those from Vietnam and elsewhere in the world) WTP. **Model 2** analysed Vietnamese respondents' WTP. **Model 3** analysed non-Vietnamese respondents' WTP, regardless of whether they departed from Vietnam or overseas. The study used the conditional marginal effects of these models to examine the power of the effect of predictor factors on respondents' WTP.

The income variable is a crucial factor for estimating WTP in CVM studies (Ahmed et al., 2007; Asafu-Adjaye & Tapsuwan, 2008; Samdin et al., 2010; Siew, Yacob, Radam, Adamu, & Alias, 2015; Tonin, 2019; Trujillo, Carrillo, Charris, & Velilla, 2016; Wang & Jia, 2012;). In this analysis, ***inc*** is positive and statistically significant in Models 1 and 2 at 5% and 1% levels, respectively. This implies that the income variable plays a significant role in the WTP of Vietnamese and combined respondents. However, ***inc*** is insignificant in Model 3. This result means that income is not an important factor in foreign respondents' WTP for conservation efforts in the CLC MPA. This finding is similar to Piriyapada and Wang's (2015) study that investigated differences in WTP between Thai and foreign visitors for resource protection in the Ko Chang Marine National Park. Their result shows that the income variable is statistically significant only in single bounded and DBDC models of domestic respondents (at the 5% level). The positive ***inc*** sign is the same as previous studies (e.g., Bateman et al., 2005; Landry et al., 2018; Yoo & Yang, 2001). The result indicates that respondents with higher incomes (in Models 1 and 2), are likely to pay more for conservation efforts in the CLC MPA. A one unit increase in their income increases respondents' WTP by approximately 0.015% and 0.24% in Models 1 and 2, respectively. In other words, if the respondents' monthly income increases by US$100, their WTP will rise by 1.5% and 24%, respectively.

Table 6.8 Generalised Linear Models for WTP for conservation in the CLC MPA

Variable	Combined respondents (Model 1)		Vietnamese respondents (Model 2)		Foreign respondents (Model 3)	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
inc	7.17e-05** (3.39e-05)	1.505e-04	0.0013*** (3.3e-04)	2.363e-03	-3.03e-05 (3.58e-05)	-9.45e-05
ef_rating	-0.402*** (0.0434)	-0.844	-0.390*** (0.0529)	-0.738	-0.337*** (0.0798)	-1.050
manager	0.166** (0.0688)	0.365	0.130* (0.0701)	0.255	0.150 (0.194)	0.490
secondary	-0.409** (0.173)	-0.713	-0.238 (0.165)	-0.404	-1.793*** (0.109)	-2.665
qlty_beach	0.00906 (0.0445)	0.019	-0.0237 (0.0469)	-0.045	0.242** (0.106)	0.754
env_act	0.121** (0.0604)	0.257	0.164** (0.0644)	0.312	0.0993 (0.166)	0.316
valueCLC	-0.392 (0.479)	-0.682	0.215*** (0.0619)	0.455	-1.371*** (0.283)	-2.372
ef_increase	0.0667** (0.0335)	0.140	0.0659* (0.0351)	0.125	0.157** (0.0767)	0.488
eco_edu	0.0775** (0.0369)	0.163	0.0436 (0.0374)	0.082	0.304** (0.130)	0.946
Constant	1.094*** (0.319)		0.972*** (0.376)		-0.986 (0.874)	
Obs	394		325		69	
LL	-686.21		-532.47		-147.42	
χ^2	193.32***		125.82***		1353.78***	
AIC	1392.427		1082.932		310.847	

Robust standard errors in parentheses
*** *p<0.01*, ** *p<0.05*, * *p<0.1*

Only ***ef_rating*** and ***ef_increase*** are statistically significant in all three models. The ***ef_rating*** is negative and is significant at the 1% level, which implies that either Vietnamese or non-Vietnamese, or combined respondents will pay less for conservation if they think that the current entrance fee is very expensive. In other words, if respondents rate the price of entrance fee at a higher point (in the five-point scale), their WTP for conservation decreases proportionally by 0.738 to 1.05 (or from 73.8% to more than a 100%). The entrance fee is considered a proxy for the partial cost of visiting the MPA. The higher the respondents perceive the cost of visiting the CLC MPA, the lower the possibility that they will pay an additional amount for conservation efforts in the CLC MPA.

In contrast, the ***ef_increase*** variable has a positive sign in all models and is statistically significant at 5%, 10%, and 5% in Models 1, 2, and 3, respectively. The ***ef_increase*** variable investigates respondents' awareness of conservation and environmental protection in the CLC MPA using an increased entrance fee. The result means that respondents with higher ***ef_increase*** scores will contribute more for conservation. In other words, a one point (or a one unit) increase in the respondents' ***ef_increase*** increases their WTP by 14%, 12.5% and 48.8% (for combined, Vietnamese and non-Vietnamese respondents, respectively). The Bonaire National Marine Park is an example of respondents' support for an increased entrance fee that has led to better conservation management. Dixon et al. (2000) notice that the Park was operating at a financial deficit because there was no entrance fee. The authors found that visitors were willing to pay an entrance fee of an average US$ 10 per dive, so long as the coral reefs in the Park were conserved and protected. Ten years later, Uyarra, Gill and Côté (2010) find that implementation of the new entrance fee, US$10 per person per dive, had transformed the park in terms of financial sustainability and users' perspectives; divers were impressed by the improvements made to the environment. In addition, the surveyed divers' mean WTP was still higher than the entrance fee, which implies that the respondents were more than happy to pay a higher fee for diving in the Park.

The rest of the independent variables are statistically significant in either Models 1 and 2, or Models 1 and 3, or Models 2 and 3, or only in Model 3. For example, the ***manager*** and ***env_act*** variables are statistically significant in Models 1 and 2 but two other predictors are statistically significant in Model 1 and 3 (***secondary*** and ***eco_edu***). The ***qlty_beach*** variable is statistically significant in only Model 3. The ***valueCLC*** variable is statistically significant in Models 2 and 3.

Both ***manager*** and ***env_act*** variables are positive, but at different significance levels, in Models 1 and 2, which means that they both positively affect the WTP of the combined group and Vietnamese respondents. The ***manager*** is statistically significant at 5% and 10% level for Models 1 and 2, respectively. This result implies that if a respondent is a manager, a business owner or self-employed, their WTP increases from 25.5% to 36.5% depending on whether the respondent is Vietnamese or Vietnamese/non-Vietnamese (the combined group). Table 6.8 shows that the marginal effect of ***manager*** on the respondents' WTP is higher if the respondents are in the combined group, compared with Vietnamese respondents only. In contrast, the ***env_act*** variable, significant at 5% in both models, has a lower marginal effect on combined respondents' WTP than on Vietnamese respondents' WTP. If Vietnamese respondents had participated in any environmental protection activities, their WTP increases by 31.2%. For the combined group, the increase is less (25.7%). Carson and Mitchell's (1993) study found similar results: respondents' environmental perceptions positively influence their WTP. If respondents agree that it is important to protect nature and limit the impact of human activities, they are willing to pay more in annual tax. Other studies (e.g., Goodman et al., 1998; Machairas & Hovardas, 2005; Oglethorpe & Miliadou, 2000) found that if a respondent belongs to any environmental protection club/organisation, s/he is more willing to pay extra for conservation programmes or the protection of natural areas.

Regarding the other respondents' characteristics, the ***secondary*** variable is negative and statistically significant with *p-values* of *<0.05* and *<0.01* in Models 1 and 3, respectively. It is likely that respondents from the combined group or foreign respondents, who have secondary school as their highest education level, will have decreased WTP for conservation in the CLC MPA. The marginal effect of the ***secondary*** variable on the WTP is more than 266% for foreign respondents and over 71% for combined respondents. Education is considered a proxy for income; higher education may mean that a respondent has a higher income. In this case, secondary school education is considered a low education level. Respondents with lower education levels may have lower incomes, which means they are less likely to pay more for 'invisible' values such as conservation. This finding is similar to previous studies. For example, college graduate respondents (Arin & Kramer, 2002) or respondents with higher levels of education (Samdin et al., 2010; Yu, Cai, Jin, & Du, 2018) were willing to pay more because they have a greater appreciation of, and knowledge about, the importance of the environment. They want to contribute to conservation efforts by paying extra. More importantly, respondents with higher education levels are presumed to have higher incomes than people with lower education levels meaning they can afford to pay more for conservation.

In contrast, the ***eco_edu*** variable has a positive effect on respondents' WTP. It is statistically significant at 5% in both Models 1 and 3. Clearly, respondents believe that eco-education enhancement for visitors will have a positive marginal effect on their WTP, by 16.3% and 94.6% in Models 1 and 3, respectively. The marginal effect is nearly six times higher for the foreign respondents', compared with the combined respondents' group. Like Machairas and Hovardas (2005), and Wang and Jia (2012), this study suggests that environmental/ecological education for respondents or MPA users plays an important role in maintaining the quality of nature and contributing to the biodiversity of natural parks or protected areas. Enhancement of environmental education not only helps reduce users' impact on the environment but also strengthens their environmental protection awareness. Enhancement of eco-education for visitors is in line with what the local government is doing in the CLC MPA, e.g., visitors are not allowed to bring any single-use plastic bags to the island. However, the use of plastic bags is not the only issue created by increased visits to the CLC MPA. There are also problems related to waste disposal and overcrowding because of the increased number of visitors.

Table 6.8 shows that the ***valueCLC*** variable is statistically significant at the 1% level in Models 2 and 3. However, its influence on respondents' WTP is in the opposite direction in the two models. The coefficient is negative in Model 3 and positive in Model 2. In short, Vietnamese and foreign respondents may have different opinions on the most important value provided by the CLC MPA. If foreign respondents think that the most important factors are job creation and increased foreign exchange in the CLC MPA, then their WTP for conservation efforts there will decline. The results may also suggest that residents and the CLC MPA management board that rely on resources from the CLC MPA and tourism have enough revenue to cover their living expenses, their conservation programmes and other management duties. These benefits are the result of increased employment rates and foreign exchange through rising visitor numbers. In turn, foreign respondents felt it was not necessary to pay an additional amount for conservation efforts. However, Vietnamese respondents' think differently about this issue. If they think jobs and foreign exchange are the most important features of the CLC MPA. They will contribute approximately 45.5% more for conservation through an additional entrance fee. Like previous studies (e.g., Babier et al., 1997; Cesar, 2000; Seenprachawong, 2002), we must also consider policy related to the marine tourism industry. Vietnamese respondents have seen the destructive results of increased visitor numbers on various marine parks. Thus, many are willing to support conservation/preservation efforts associated with such areas. In Seenprachawong's (2002) study, local respondents strongly disagreed that Thailand should increase the number of jobs by developing its forest, sea or land resources (which would damage the environment). In short, they would not support tourism if it meant degrading the environment and depleting natural resources. K. Brown et al. (2001) conclude that policy makers should consider the effects of development on the ecosystem in the Buccoo Reef Marine Park. The authors proposed four development scenarios for the park and analysed the trade-off between MPA management and each scenario. Their results show that expansive tourism development scenarios (or those which would create numerous jobs) in the park have a more negative impact on the environment than limited tourism development scenarios (fewer jobs). The latter scenarios would preserve the water quality by avoiding increased eutrophication and protect the health of sea grass and the coral reef.

The ***qlty_beach*** variable is statistically significant only in Model 3, $p < 0.05$. The coefficient is positive, which means that foreign respondents are willing to pay 75.4% more for conservation if they think that the quality of the beach in the CLC MPA will increase by one point. This finding is identical with previous studies (see Carson & Mitchell, 1993; Landry et al., 2018; Piriyapada & Wang, 2015), which found that a better quality beach/ecosystem, the more that respondents were willing to pay. In this case, the respondents were foreign visitors.

In sum, the chi-square test results in Table 6.8 show that all three models are statistically significant at the 1% level. The AIC value is smallest in Model 3. The log-likelihood result is the lowest in Model 1. Seven independent variables are statistically significant in Model 1: ***inc***, ***ef_rating***, ***manager***, ***secondary***, ***env_act***, ***ef_increase***, and ***eco_edu***. Six predictors, ***inc***, ***ef_rating***, ***manager***, ***env_act***, ***valueCLC***, and ***ef_increase***, are statistically significant in Model 2. Model 3 also has six statistically significant predictors (***ef_rating***, ***secondary***, ***qlty_beach***, ***valueCLC***, ***ef_increase***, and ***eco_edu***).

6.4 WTP Estimates

As previously noted, the CLC MPA already has an established entrance fee of VND70,000 (US$3.13) per person per visit. Most survey respondents chose a positive bid value as their WTP for the conservation in the CLC MPA. This means that the respondents in this study were willing to pay an additional amount over the current entrance fee when they visited the CLC MPA. Non-parametric and parametric estimates of the mean WTP were elicited (see Table 6.9). The differences between the mean WTP of the three different groups are apparent in Table 6.9. The two-sample test results show that the differences between the mean WTP values in three groups are statistically significant at the 1% level. Foreign respondents were willing to contribute most towards conservation efforts. Vietnamese respondents were willing to pay approximately 43% - 44% less than the foreign respondents.

Table 6.9 Respondents' WTP for conservation in the CLC MPA (US$)

	Combined respondents	Vietnamese respondents	Foreign respondents
Non-parametric estimates	2.24	1.98	3.47
(95% C.I.)	(2.09 - 2.4)	(1.84 - 2.12)	(2.99 - 3.95)
Parametric estimates	2.26	1.99	3.56
(95% C.I.)	(2.16 - 2.37)	(1.92 - 2.06)	(3.13 - 3.99)

Table 6.9 also shows that the mean WTP was different between non-parametric and parametric estimates. However, the 95% confidence intervals (in parentheses) overlap between the two estimates for the three groups of respondents. The 95% confidence intervals in the non-parametric estimate are wider and cover the values in predicted estimates, which means that there is a nominal difference between the mean WTP estimated by these two methods.

Median WTPs from the parametric estimates were also elicited from the WTP models. The results show that the median values are all lower than the mean WTP for the three groups (at US$1.91, US$1.85, and US$3.47 for the combined group, Vietnamese, and foreign respondents).

- **Conservation Benefits from WTP for Conservation**

The number of visitors travelling to the CLC MPA have increased dramatically over the last 10 years. It has increased by 20 times from 2008 to 2018 (Nguyen, 2019). Though the increased visitor numbers generate economic benefits for local residents who lost their income through the establishment of the MPA, there have been negative environmental effects (Ngoc, 2018). The CLC MPA receives over 3,000 visitors daily during the tourism season, which is higher than the number of residents on the islands (3,000) (Ngoc, 2018). Tourism development has contributed financially to the management of the CLC MPA, as well as conservation programmes. However, it has also created pressure on the biodiversity of the CLC MPA and caused environmental damage (e.g., degradation of the beaches and coral reefs). The question is, if the MPA management board and local authorities increase the current entrance fee by a marginal price, based on respondents' mean WTP, would this decrease the number of visitors, and/or impact the park's financial sustainability and/or conservation activities?

Table 6.10 Total number of visitors and changes between years

Year	Number of visitors	Change from previous year (%)
2005	4,734	
2006	7,096	+49.9
2007	17,710	+149.6
2008	20,160	+13.8
2009	34,633	+71.8
2010	43,113	+24.5
2011	70,000	+62.4
2012	105,074	+50.1
2013	195,000	+85.6
2014	222,048	+33.0
2015	367,548	+65.5
2016	402,187	+9.4
2017	407,315	+1.3
2018	399,682	-1.9
	Average change (2005 – 2018)	+45.8
	Average change (2016-2018)	+2.9

Source: Trinh (2014b), Nguyen (2019)

Table 6.10 provides visitor numbers for 13 years and shows changes to the number of visitors since the CLC MPA was established in 2005. The number of visitors has increased by 45.8% per annum, on average, from 2005 to 2018. In three years (2016 – 2018), the change has been a positive, average increase of 2.9% per annum. This means that the number of visitors to the CLC MPA has remained stable (about 400,000), for the last three years. These figures may indicate that the visitor boom is over.

Six growth projections are proposed in our study, using 2.9%, 1% and 0% growth rates of the number of visitors per annum over 10 years (2019 – 2028). Each projection has either the current entrance fee or the proposed entrance fee. The current entrance fee is a two-tier system; full price is applied to adults (18 years old and above), and half price for children (below 18 years). If 80% of the total visitors

Table 6.11 Projections of visitor growth under three scenarios with two entrance fees

Projection	Increased number of visitors (%)	Entrance fee (US$)
P11	2.9	3.13*
P21	1	3.13
P31	0	3.13
P12	2.9	5.39**
P22	1	5.39
P32	0	5.39

** Current entrance fee*
*** Proposed entrance fees*

are adults and 20% are children, then the total revenue is calculated by adding together the entrance fees for both adults and children. The proposed entrance fee is based on the current entrance fee topped up by the respondents' mean WTP (US$2.26 from Table 6.9). Table 6.11 presents six projections using three scenarios of visitor growth in the CLC MPA for the next 10 years with two entrance fees (the current entrance fee and the proposed entrance fee). A discount rate[13] of 3.88% is used to calculate the total revenue of the CLC MPA from the entrance fees.

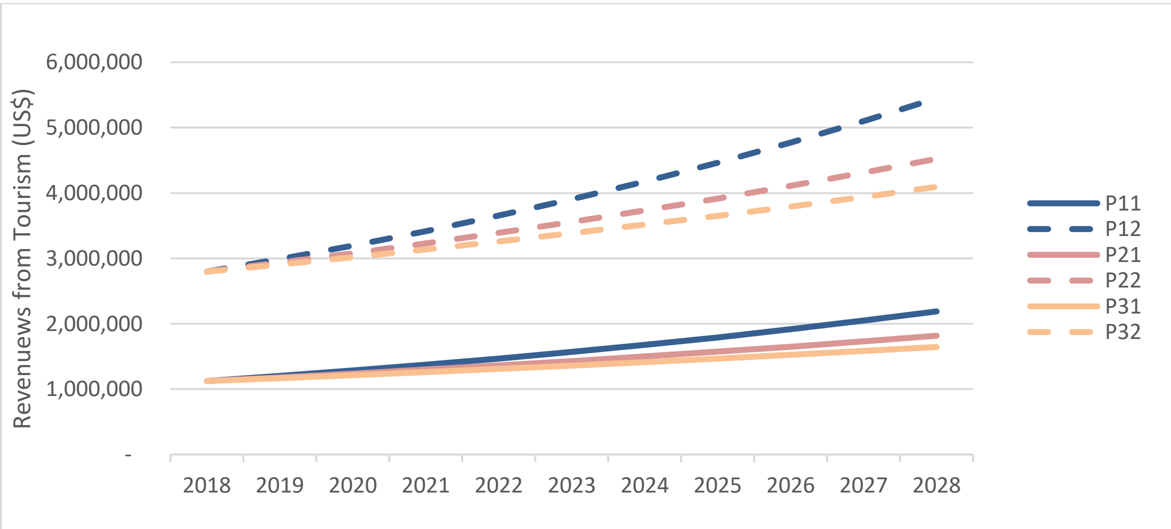

Figure 6.3 Six projections of total revenue from tourism with two entrance fee levels

Figure 6.3 illustrates the estimated revenue from tourism in the CLC MPA from the six projections. The results show that the lowest revenue from the proposed entrance fee in projection P32 (dash blue

[13] The value of discount rate is from the World Bank statistics for 2018.

line) is almost double that from the current entrance fee in P11 (the highest value with the current entrance fee – the blue line). The results indicate that by applying a new entrance fee system (the proposed value), the CLC MPA would not have to increase the number of visitors, but it would still have a guaranteed financial fund to manage the park and ensure the continuation of its conservation efforts.

6.5 Summary

This chapter discussed the surveyed respondents' WTP for conservation efforts in the CLC MPA using the CVM. The payment card format in the CVM was used to determine how much respondents were willing to pay for conservation efforts. The results from the log-normal regressions indicate that the WTP depended on what group to which the respondents belonged (combined, Vietnamese or foreign respondent). The WTP is also affected by the respondents' characteristics, their perceptions of environmental protection and conservation and their assessment of the current CLC MPA entrance fee.

The results from the empirical models show that foreign respondents' WTP was significantly affected by their education level (***secondary***), their evaluation of beach quality and the most important value provided by the CLC MPA (***qlty_beach*** and ***valueCLC***), their environmental awareness (***eco_edu***) and their assessments of the current entrance fee (***ef_rating*** and ***ef_increase***). Vietnamese respondents' WTP was affected by demographic factors (***inc*** and ***manager***), their participation in environmental protection activities (***env_act***), their assessment of the most important value and the cost to visit the CLC MPA (***valueCLC, ef_increase*** and ***ef_rating***). The combined group was not aggregated from these two groups. The WTP of combined respondents was significantly influenced by seven factors: ***inc***, ***ef_rating***, ***manager***, ***secondary***, ***env_act***, ***ef_increase***, and ***eco_edu***.

Non-parametric and parametric WTP estimates were calculated and compared among the three groups of respondents. The results show that the WTP estimates were statistically significant and differed between the three groups. Foreign respondents were willing to pay a higher entrance fee than Vietnamese respondents (US$3.56 and US$1.99, respectively). The estimated WTP was also used to calculate the CLC MPA's total revenue for six projections: increased visitor numbers with two different entrance fees (the current and proposed value). The total revenue from projection P32 is twice the revenue from P11. This result indicates that if the proposed entrance fee were introduced, the CLC MPA management would not only have sufficient funds, but also that the number of visitors may decline slightly, which would reduce some of the pressure on the environment, natural resources and coral reefs.

Chapter 7

Conclusion and Implications

7.1 Introduction

Marine and environmental management are challenging for a developing country like Vietnam. The country has approximately 3,260 km of shoreline and over 3,000 islands (APN, 2011). Many socio-economic activities take place in its coastal areas. Although these activities bring much needed revenue, they also have a negative impact upon marine life. As Geleto (2011) notes, "You cannot manage the environment and natural resources unless you value them" (p. 8). This study has estimated both the use and non-use values of the CLC MPA in Vietnam using TCM and CVM.

This chapter summarises the determinants, recreational value estimates and respondents' WTP for conservation in the CLC MPA. This chapter is structured as follows: section 7.2 presents the study's overall findings and section 7.3 discusses the policy implications of these findings. Section 7.4 concludes the chapter by outlining the study's limitations and providing recommendations for future research.

7.2 A Summary of the Study's Findings

7.2.1 The Travel Cost Method Models

This study used both the ZTCM and ITCM to investigate the determinants affecting the visitation rate and frequency of visits to the CLC MPA. The ZTCM describes the demand for recreation values in the CLC MPA using respondents' visitation rate from different zones of origin. The visitation rate was calculated based on the number of respondents from each zone over the total population of that zone. The ITCM uses the number of visits that each respondent made to the CLC MPA over a period of five years (2013 – 2018) to estimate respondents' recreational demands.

The most important factor in the travel cost method is respondents' total travel cost; it includes the return travel cost from their home to the CLC MPA and other related costs such as onsite expenses and the opportunity cost of time. The travel cost was calculated using estimated transport costs (these differ depending on the mode of transport) or their stated amount (the amount they indicated in the questionnaire). If domestic respondents flew to the CLC MPA, their travel cost was either estimated based on the information provided by the Ministry of Transport[14] or the amount they provided in the

[14] Circular No. 17/2019/TT-BGTVT of the Ministry of Transport on the Issuance of Prices for Passenger Transport Services on Domestic Air Routes.

questionnaire. If their stated cost in the questionnaire was higher than airfare defined in the Ministry's circular, the airfare in the circular was used. Otherwise, the respondents' stated amount was applied. This ensured that the respondents' total travel costs were not overestimated. If the respondents used a scooter (a two-wheeled vehicle) to travel to the CLC MPA, then their travel costs included estimated fuel costs, depreciation costs and parking fees. The travel costs of respondents who visited the CLC MPA by travel bus were calculated using the bus fare rate with the return distance between the respondent's home (the nearest administration centre) and the CLC MPA. Similarly, a return train ticket fare was used for respondents who used the train as their main form of transport.

Respondents' onsite expenses covered their ferry fees, entrance fees, local sanitation fee, meals, accommodation on the CLC MPA island (if any) and any other related costs. The opportunity cost of time included the total cost of the time that the respondents spent travelling and onsite. This cost was calculated using a proportion of the current wage rate. A quarter of the wage rate is considered the lower bound and was used to estimate the opportunity cost of time in this study. Non-earning respondents, students and homemakers, were ascribed a zero-wage rate. In short, their opportunity cost of time was zero.

7.2.1.1 Empirical Findings from ZTCM Models

In the ZTCM, surveyed respondents were divided into 21 zones of origin, depending on their point of departure (not their citizenship). Zones with one observation or fewer were removed from analysis. This meant that there were 20 zones of origin to analyse recreational demand. Linear regression, using OLS estimation, was used to construct the demand function for recreation, which includes the dependent variable (the visitation rate – ***VR***) and 30 independent variables. The ***VR*** was calculated by dividing the total number of respondents from a particular zone by the population of that zone (in thousands). For example, if there are 10 respondents who visited the CLC MPA from zone A and the population of zone A is one million, then the ***VR*** (per one thousand inhabitants) is calculated by dividing 10 by 1,000, i.e. the ***VR*** is 1%. To put it another way, the ***VR*** from zone A is 1% over 1,000 of inhabitants.

Three different travel cost variables were tested in the ZTCM demand model, including the ***TC00*** (the cost of travelling only), the ***TC1*** (the cost of travelling and onsite costs), and the ***TC2*** (the travelling cost, onsite cost and opportunity cost of time). Four different forms of linear regression were considered: linear, semi-log (dependent variable), semi-log (independent variable), and log-log. The first assumption in the OLS linear regression requires that the dependent variable (***VR***) and independent variable(s) have a linear relationship. The graphic matrix of the relationship between the ***VR*** and travel cost variables indicated that they were not linear, which means that these variables should be transformed into another form. The Box-Cox transformation approach revealed that the natural logarithm form would help to create a linear relationship between the variables. The log-log form was chosen because it provided the best results. Three travel cost variables were applied in the demand model. However, the model with the ***TC00*** variable did not satisfy the model assumptions related to the normal distribution of residuals. Only two models, the ***TC1*** and ***TC2*** variables, were used to analyse the impact of the predictors on the recreational demand in the CLC MPA. Before examining the relationship between the ***VR*** and determinant factors affecting the ***VR***, including the travel cost, we applied some basic diagnostic tests to detect any influential observations and eliminate any problems that might cause biases in the statistical analyses. The correlations between the independent variables were also examined (see Appendix B). Any variables with correlations higher than 0.7 were removed from the models as the basic assumption was violated because of the existence of multi-collinearity among the variables (Gujarati, 2009).

The empirical results in Table 5.8 reveal the models that fit best. The ***VR*** from the respondents' zone of origin was used as the dependent variable. As expected, the most important predictor in the travel cost models – the travel cost variables (***TC1*** and ***TC2***) were negative and statistically significant. The price elasticity of the recreational demand (see Table 5.10) shows an inelastic relationship between the travel cost and the ***VR***. This means that the demand function is unchanged with a change in respondents' travel costs.

Generally, the significant predictors in Model 1 are also significant in Model 2 (see Table 5.8), except for income. The income variable (***inc***) was statistically significant only in the demand model with the travel cost variable ***TC1***. The negative coefficient of the income variable is popular in travel cost studies (e.g., Chae et al., 2012; Creel & Loomis, 1990). This result indicates that lower-income visitors are more likely to visit the CLC MPA.

Respondents' socio-economic characteristics also have a significant influence on the ***VR***: These are, household size (***hhsize***), respondents' gender (***gender)***, and their education level (***highschool***). These variables all have a negative impact on the ***VR***, which means that if the respondents are from a larger household (more family members), they are female, or their highest education level is high school the ***VR*** will decrease.

Similarly, the respondents' means of transport is negative and significantly affects the ***VR***. If respondents use a travel bus (***travelbus***) or train (***train***) to visit the CLC MPA, their ***VR*** declines. The decrease is dramatic if the respondents travel by train. The respondents' evaluation of the CLC MPA's quality also plays an important role in the respondents' ***VR***s. Unexpectedly, their quality evaluation of the CLC MPA beaches (***qlty_beach***) significantly, negatively affects the ***VR***.

In contrast, respondents' citizenship and their tourist behaviour have a positive effect on ***VR*** to the CLC MPA. If they are Vietnamese respondents (***vne***), the ***VR*** will sharply increase; it was over three times higher than for non-Vietnamese respondents. In addition, the respondents' time spent in the CLC MPA (***timeCLC***), their type of accommodation (***homestay***), or their primary purpose for visiting the CLC MPA (***business***) were also positively associated with the ***VR***. However, the respondents' total trip time (***timetrip***), including their trip to the CLC MPA, negatively influences the ***VR***. Although this impact is small, the probability of respondents making a trip to the CLC MPA decreases if the length of their total trip increases by a single day.

7.2.1.2 Empirical Findings from the ITCM Models

The ITCM model is based on the number of trips that each surveyed respondent makes over a given time. This study uses the ITCM model to determine the factors that affect the number of trips respondents had made to the CLC MPA in the five years before the survey. A factor representing a multi-destination trip was added to the ITCM model because it is believed to affect the CS. Three different models were designed: the single-destination trip, the all-purpose trip and the multi-destination trip model (Models 1, 2 and 3 in Table 5.13). Model 3 used a dummy variable (***MD***) to distinguish multi-destination trips from single-destination trips, and the ***MD_tc*** variable to capture differences in travel costs from a single-destination to multi-destinations.

Two different regression methods (Poisson and negative binomial regression) are usually applied to count data (the number of trips) as a dependent variable. Before choosing a suitable model, we first examined the difference between the mean and the variance of the data using the test for dispersion. The aim of this test was to determine whether there was over-dispersion in the data. When over-dispersion is identified, then the mean of the data is smaller than its variance; in this case, negative binomial regression is the more suitable method. Otherwise, Poisson regression should be used. The test results showed that there was no issue with over-dispersion, thus we used Poisson regression in the trip demand models.

The mean of respondents' number of trips (***visit)*** was calculated to determine whether the zero-truncated model should be applied. The results showed that the ***visit*** mean was much lower than five for all three models. According to Hilbe (2014), this result indicates that zero-truncated Poisson regression is the best option.

The travel cost variable ***TC00*** was used in the ITCM models because the mean values of the opportunity cost of time and the onsite costs for single-destination respondents were much lower than that of all-purpose respondents or multi-destination respondents. The opportunity cost (***timecost***) and onsite cost (***onsitecost***) variables were then added separately into the models to investigate their impact on the respondents' trip demand.

Table 5.13 summarises the results for the three zero-truncated Poisson trip demand models. The ***TC00*** is statistically significant in all models. However, its coefficient is positive in Models 1 and 3, which means that the CS for single-destination trip respondents (elicited from the single-destination model and multi-destination model) could not be estimated (Creel & Loomis, 1990). The travel cost coefficient should be negative to estimate the CS based on Equations (3.4). In general, all predictors have an identical effect on respondents' trips in Models 2 and 3, except for ***TC00*** (as discussed above), ***MD***, and ***MD_tc*** (only added in Model 3). In particular, the cost (***timecost*** and ***onsitecost***) variables, respondents' characteristics (***postgrad***, ***occupation***, and ***vne***), and the purpose of visit to the CLC MPA (***rel_visit*** and ***business***) variables all have a positive influence on respondents' visits in Models 2 and 3. The time that the respondents spent in the nature when visiting the CLC MPA (***timeNAT***) and the other places that they visited during their trip (***danang***) have a negative impact on their visits to the CLC MPA in these models. Because of collinearity, some independent variables were omitted from Model 1. They were: ***rel_visit***, ***business***, ***occupation***, ***danang***, and ***vne***. Except for ***TC00***, only ***postgrad*** is negative and statistically significant in Model 1.

Table 7.1 Significant determinants affecting respondents' VRs and visits to the CLC MPA

Factor	Respondents' VR		Respondents' visits		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 3**
inc	- -				
hhsize	-	-			
gender	- - -	- - -			
highschool	-	-			
timeCLC	+++	+++			
timetrip	- - -	- - -			
homestay	+++	+++			
travelbus	- - -	- - -			
qlty_beach	-	-			
train	- - -	- - -			
travel cost	- - -	- - -	+	- - -	+++
business	++	++		+++	+++
vne	+++	+++		+++	+++
postgrad			- - -	+++	+++
timecost				+++	+++
onsitecost				+	++
timeNAT				-	-
rel_visit				+++	+++
occupation				+++	+++
danang				- - -	- - -
MD_tc					- - -

+++/++/+: Positive and significant at 1%, 5%, 10%, respectively.
---/--/-: Negative and significant at 1%, 5%, 10%, respectively

There is much debate about whether multi-destination or multi-purpose trips should be included in demand models. However, empirical evidence from recreation studies (e.g., Loomis, 2006; Parsons & Wilson, 1997) indicates that respondents' CS is overestimated if multi-purpose trips are not considered in the demand models. In this study, the trip demand models were also used to estimate respondents' CS using recreational values from the CLC MPA. The results in Table 5.14 demonstrate that the CS is overestimated if multi-destination trips are omitted from the demand model, with a 2.7% difference. Even if the CS is nominally different between multi-destination and all-purpose trip models, the total benefit generated from the recreation value in CLC MPA is overestimated by approximately VND25 billion (or US$1.2 million) for 2018. In sum, the aggregate recreational benefit from the CLC MPA is estimated to be approximately VND950 billion (or US$42.4 million) per year, for 2018 if multi-destination trips are considered in the demand model. The figure increases to VND975 billion (US$43.6 million) if multi-destination trips are omitted from the demand model.

Table 7.1 summarises the determinants that statistically affect respondents' ***VR***s and their trips to the CLC MPA in this study.

7.2.2 Contingent Valuation Method Models

One objective of this study was to investigate the respondents' WTP for conservation when visiting the CLC MPA. The CVM was used to determine the respondents' WTP an additional amount for conservation programmes. Respondents who indicated that they would be willing to pay money towards this purpose were provided with a series of bids in payment card format. Their motivation for being WTP were mostly for conservation and preservation and the improvement of environmental quality in the CLC MPA. There were some protest bidders among the respondents (they constituted approximately 65% of the "no" respondents who stated that they would not pay additional amount for conservation). These respondents were eliminated to avoid biasing the WTP results. The remaining "no" respondents were considered valid zero bidders.

Because of the skewness of the respondents' bids, I used log-normal regression with the maximum likelihood estimator to investigate the factors affecting respondents' WTP, as well as to determine the WTP estimate from the models. Respondents were divided into three different groups: combined, Vietnamese, and foreign visitors, which were analysed in Models 1, 2, and 3 (Table 6.8), respectively. Following T. Cameron and Huppert (1989), bid intervals were used to determine respondents' WTP, rather than point values, to ensure that respondents' WTP were not underestimated (which may have occurred if bid point values were used).

The results in Table 6.8 show that the predictor factors affecting WTP differed for each of the three groups. In other words, some determinants are statistically significant for combined and Vietnamese respondents' WTP values (Models 1 and 2): respondents' income (***inc***), their occupation (***manager***), or their participation in environmental protection activities (***env_act***). Other explanatory variables are statistically significant in Models 1 and 3 but not statistically significant in Model 2. They are respondents' education level (***secondary***) and their views on enhancing eco-education for tourists (***eco_edu***). Respondents' ratings for the current CLC MPA entrance fee (***ef_rating***), and their support for an increased entrance fee for a conservation programme and environmental protection in the CLC MPA (***ef_increase***) were statistically significant in all three models. In contrast, Vietnamese and foreign respondents' WTP was significantly affected by their assessment of the CLC MPA's most important value (***valueCLC***). If jobs and foreign exchange are considered the most important values of CLC MPA, this affects Vietnamese and foreign respondents' WTP in opposite ways (positive and negative, respectively). Respondents' assessment of the quality of the beaches in the CLC MPA (***qlty_beach***) is statistically significant only in Model 3. Table 7.2 summarises the determinants that influence respondents' WTP for conservation in the CLC MPA and the WTP estimates for the three groups of respondents in Models 1, 2, and 3.

Table 7.2 Significant determinants affecting respondents' WTP for conservation of the CLC MPA

Factors	Model 1	Model 2	Model 3
inc	++	+++	
ef_rating	- - -	- - -	- - -
occupation (manager)	++	+	
education (secondary)	- -		- - -
qlty_beach			++
env_act	++	++	
valueCLC		+++	- - -
ef_increase	++	+	++
eco_edu	++		++
WTP estimation (US$)	2.26	1.99	3.56

+++/++/+: Positive and significant at 1%, 5%, 10%, respectively.
---/--/-: Negative and significant at 1%, 5%, 10%, respectively.

The three models were used to estimate the three groups of respondents' WTP (see Table 6.9). The mean WTP differs significantly among the three groups. Not surprisingly, Vietnamese respondents were willing to pay least, and foreign respondents were willing to pay most. There was approximately 43% difference between the Vietnamese and non-Vietnamese respondents' WTP. In addition, the 95% confidence interval values illustrate that the foreign respondents' WTP is much higher than Vietnamese respondents' WTP.

The mean WTP was used to elicit the total benefit of the CLC MPA from the proposed entrance fee (the current entrance fee topped up with the mean WTP value) and the current entrance fee using three growth rates (2.9%, 1% and 0%) of the total number of visitors. Figure 6.3 shows that the total revenue from the proposed entrance fee is much higher than that from the current entrance fee over the next 10 years. This means that if the number of visitors did not increase over the 10 years (from 2019 to 2028), the total revenue (from the proposed entrance fee) is still higher than that expected using the current entrance fee with the number of visitors increasing 2.9% annually (at a discount rate of 3.88% per year).

7.3 Policy Implications of the Study

Since its establishment, the CLC MPA has become a popular area for recreational activities such as diving or snorkelling in the coral reefs. The conservation of MPA is even more important given the increased visitor rate. Tin et al. (2019) find that tourism development (underwater activities), apart from other impacts (marine pollution, natural conditions such as storms or erosion, and coastal construction activities), has caused a decrease in seagrass bed from 55.98 ha to 12.78 ha between 2003 and 2017. This study provides important information for policy makers to ensure that satisfying visitors' recreational demands is balanced with conversation and environmental protection.

The results of the recreation value inferred from the TCM models (CS) show that the CLC MPA has its own use value. The local authority's decision to establish an entrance fee for the CLC MPA is not only reasonable but essential, because it has become a recreation and tourism destination. This result is similar to W. Chen et al.'s (2004) finding that confirmed that the introduction of an entrance fee to visit the beach in Xiamen Island, China, was necessary because of its key function in tourism and recreation. Latinopoulos (2014) contends that results from travel cost analyses (cost-benefit analyses) are useful for policy makers regarding environmental protection, the management of conservation programmes and environmental impact assessments.

The CLC MPA is a public area that has become increasingly popular. The number of visitors travelling to the CLC MPA has dramatically increased over the past 10 years (approximately 46% annually). Though the increasing numbers of visitors has brought more money into the area, it has also negatively affected the environment and the island's natural resources. The ZTCM models reveal that respondents' assessments of the quality of the beaches in the CLC MPA has a negative relationship with respondents' VR. This implies that there is likely a social control to the VRs based on the quality of the recreation area. Like Cooper and Loomis's (1993) study, these results suggest that the better the quality of the beach, the more popular and crowded it is likely to be. Thus, some individuals may choose not to visit the recreation site. This is a key factor in respondents' decision to visit (or not visit) the island. Limiting the number of visitors is crucial to protect the environment. If the beaches become crowded, eco-visitors may not visit the site. Local authorities must consider the management and environmental protection of the CLC MPA. One way to do this is to restrict the number of visitors/visits because degradation of coastal areas and marine resources through increased visitor numbers may lead to a decline in recreational benefits, marine resource biodiversity and the general environment. A visitor is allowed to visit the CLC MPA only if they pay for an entrance fee (entry ticket). The CLC MPA management board may be able to control the total number of visitors per day by limiting the number of entry tickets it sells. The MPA also needs to estimate the maximum capacity of the island (the maximum number of visitors allowed on the island per day) to avoid pressure from tourism on the MPA.

Demographic factors such as household size, gender and education level affect the ***VR*** in the ZTCM models. These characteristics likely indicate respondents' ability to afford the costs of a trip to the CLC MPA. Respondents from larger households (total number of members), female respondents or respondents whose highest education level is high school seem to make fewer visits to the CLC MPA (see Table 5.8). Though policy makers cannot do anything about demographic factors, Ward and Beal (2000) suggest that the relationship between these characteristics and the demand from the respondents' zone of origin could be used to forecast respondents' recreational demands as well as the future demand for tourism facilities and infrastructure. Local authorities, CLC MPA managers and tour agents could design tour packages that are suitable for women or offer family discounts so that those with family members or those with lower income levels would be able to visit. The authorities and managers may also consider reserving more free public recreational spaces as well as introducing public transport around the island to reduce cost for the visitors.

Other findings from the ZTCM models suggest that the CLC MPA is considered a recreation destination for respondents who are on a short holiday. Respondents who are having a longer holiday are less likely to visit the CLC MPA. We found that local respondents were more likely to spend more time on average in the CLC MPA than non-local respondents. They also have the highest VRs compared with respondents from other zones. This result indicates that the CLC MPA is a holiday destination for local respondents.

The results of price elasticity in the ZTCM models reveals that the ***VR*** from respondents' zones of origin is inelastic with their travel cost. This finding echoes Moeltner's (2003) study. Local authorities should develop strategies that limit or decrease the current number of visitors to the CLC MPA to protect the environment and avoid further degradation. One strategy would be to increase the current entrance fee; this would make up for any revenue shortfall through a decreased number of visits. This means that the CLC MPA would gain the same amount of (or would have increased) funding for CLC MPA management and other conservation and environmental protection activities.

The CS estimates from the ITCM models indicate that multi-destination trips should be accounted for in ITCM models because omitting them may lead to biased results when estimating the total social benefit from the recreation value (Loomis et al., 2000). The current CS calculation, which includes multi-destination respondents, can also help in the formulation of policies related to investment in the natural resources and conservation programmes. If multi-destination trips are omitted from the ITCM models, the total social benefit is overestimated leading to excessive investment in a recreational area to satisfy visitors' demands. Consequently, less money will be spent on other activities, such as conservation programmes.

The other findings from ITCM models show that a nearby site, Da Nang, located approximately 30 km away from the CLC MPA, has a negative impact on visits to the CLC MPA. If the respondents choose to go to Da Nang, their visits to the CLC MPA will decrease. This means that there is a comparative attraction between this site and nearby sites. Model 1 (see Table 5.8) indicates that the CLC MPA is more attractive to lower income respondents. This result implies that the current quality of the CLC MPA is inferior, like prior studies (see Ahmed et al., 2007). The CLC MPA managers may consider developing the site to be more environmentally friendly so that it appeals more to eco-visitors. At the very least, the CLC MPA should be well managed, with a high level of recreation activities to ensure that visitors are comfortable when staying on the island. There are also issues associated with transport to the island which makes other nearby sites more attractive (e.g., Da Nang).

The trip demand models (see Table 5.13) show that the opportunity cost of time is not statistically significant in the single-destination trip demand model. In this study, the time cost of the respondents, who live locally or close to the CLC MPA, is not included in travel cost for several reasons. First, their time cost is not very high because of the short travel time cost. Secondly, their trips are considered paid leisure time; these trips do not affect their income because their time away is already paid. This is also so in several previous studies (see Bell & Leeworthy, 1990; Loomis et al., 2000) where the authors consider the opportunity cost of time as the respondents' leisure time and omit it from total travel cost calculation. It is not included in the single-destination trip respondents' total travel costs as it may cause bias. However, the time cost is statistically significant in the multi-destination trip and all-purpose trip models. It plays a vital role in respondents' total travel cost estimates in these models.

The WTP estimates from the CVM models reveal that foreign respondents are willing to pay a higher entrance fee than Vietnamese respondents, to support conservation in the CLC MPA. This findings is the same as from previous studies in other countries, such as the Philippines (Ahmed et al., 2007) and Thailand (Asafu-Adjaye & Tapsuwan, 2008). Policy makers could introduce a new fee system. A two-tier two-level system may be appropriate if authorities want to keep the number of visits the same (or decrease the total number of visits) but ensure that their funds for management and conservation programmes remain the same. One way to achieve this would be to charge foreign visitors a higher entrance fee and offer domestic and local visitors a reduced rate. Children and seniors would also be offered a lower entrance fee (perhaps a 50% reduction).

7.4 Limitations of the Study and Recommendations for Future Study

7.4.1 Limitations of the Study

The first limitation relates to the use of survey data. Collecting data onsite presents some limitations. Because of time and budget constraints, I was able to collect survey data only over a short period of time (February to May 2018). In addition, most respondents were reluctant to spend a lot of time talking to the interviewer, especially those on a one-day trip. These limitations meant that fewer surveys were collected than initially anticipated. In addition, data collection was interrupted by tropical storms; visitors were not allowed to visit the CLC MPA for some of this period. Data collection thus lasted longer than anticipated and had a lower response rate than expected. Future research may consider administering both online and onsite surveys to increase the efficiency of data collection. Govigli, Górriz-Mifsud and Varela (2019) used this approach in their study. They found that the response rate between online and onsite survey was similar (33% and 39%, respectively). However, online surveys can suffer from bias as a result of self-selection, so researchers must consider this in their approach.

The second limitation relates to communication with onsite visitors, particularly foreign visitors. Many visitors came from non-English speaking countries like China or Korea. These visitors could not speak Vietnamese. These respondents were excluded from the survey because of communication issues. To deal with this problem, a tour guide who can speak languages other than Vietnamese and English can be hired as research assistant to administer the survey questionnaire.

Thirdly, this study used the payment card format to determine respondents' WTP for conservation of the CLC MPA. This method is believed to have an anchoring bias (Geleto, 2011; Mattia, Oppio, & Pandolfi, 2010) and that may affect the WTP distribution. However, there is no consensus on which format is better (e.g., Reaves et al., 1999; Xu et al., 2006). The distribution of WTP is not significantly different between payment card and other CVM techniques, such as single-bounded or DBDC. To date, no study, this one included, has investigated and compared the response rate and WTP estimation between different formats in Vietnam. These formats can be used together in future studies to investigate which format has a better response rate from the visitors on the non-use values of coastal recreation and marine resources.

Lastly, this study did not provide respondents with a lot of information about the establishment of the CLC MPA and its values, primarily because of limitations associated with the time set aside for data collection and respondents' limited time. Thus, respondents may have had only a basic understanding of the CLC MPA's environmental aims and services. This may have led them to underestimate its value. CLC MPA environmental information flyers can be delivered to the respondents before they visit the island.

7.4.2 Recommendations for Future Research

The ZTCM models indicate that beach quality has a negative impact on the ***VR***s for different origin zones. The ***VR*** decreases if the recreation site becomes popular and crowded because of its quality. Future research can investigate if a similar phenomenon occurs in other recreational sites. This information is crucial for ensuring that sites such as the CLC MPA are properly managed. Policy makers can calculate the number of visitors to recreational areas, especially those located in national parks or protected areas and determine appropriate visitation levels. I found a positive relationship between the quality of the beach and foreign visitors' WTP, which means that they can, and are willing to, contribute more for conservation and to maintain the quality of the CLC MPA.

Future research may determine local residents' WTP for conservation in the CLC MPA. Though residents who live on the island lost their livelihood (many worked as fishermen) as a result of the establishment of the MPA, they have gained revenue from tourism development. What they are willing to pay or willing to accept, is considered part of their effort to maintain sustainable tourism in the CLC MPA, which seeks to balance socio-economic development and environmental protection. As previous studies (Costanza, 1999; Sekhar, 2005) have found, conservation efforts succeed only if the local community participates in environmental and natural resource management.

Future research must carefully consider wording when asking respondents for information related to their WTP for environmental programmes. This study found that some foreign respondents misunderstood the question on paying an additional entrance fee to support conservation. They were willing to pay extra for conservation but just wanted to pay once, not several different fees. In short, WTP questions and other questions related respondents' perceptions of environmental protection and conservation need to be carefully worded to ensure respondents understand what they are being asked and what information they need to provide. These issues should be well managed in a pre-test of the survey questionnaire to avoid any information bias.

The CLC MPA is connected to other sites (such as Da Nang and Hoi An), which are more attractive to visitors because of their location and/or the ease of visiting them. This study found that visitors who were from zones located further away from the CLC MPA visited more than one recreational/visitor site during their trips. Future research can investigate and analyse the demand for bundle packages (a package deal for those wanting to visit the CLC MPA and other nearby sites). These results would be useful for local authorities and policy makers working on regional development or those who prepare cost/benefit analyses or environmental impact assessments.

Appendix A

The Survey Questionnaire

Faculty of Agribusiness and Commerce
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Canterbury, New Zealand
Phone: +64 3 423 0000
www.lincoln.ac.nz

Date Reference No. _________

Dear Sir/Madam,

If you are aged 18 years or above, you are invited to participate in a survey that constitutes part of my PhD thesis at Lincoln University, New Zealand. This is a part of my research project titled "Economic valuation: Sustainable Development in CLC Marine Protected Area, Vietnam". The purpose of this research is to estimate the total economic benefits of marine resources (including functions and services of marine resources) and terrestrial resources in CLC MPA to provide a better integrated coastal management (at local and provincial level) towards sustainable development.

This research is completely voluntary in nature and you are free to decide not to participate at any time during the process of completing the questionnaire, including withdrawal of any information you have provided. However, if you answer all the questions in the questionnaire that I will ask, it will be understood that you are 18 years of age or older and have consented to participate in this survey and consent to publication of the results of this research with the understanding the anonymity will be preserved.

Your participation is of great assistance to this research. This survey will take a maximum of 45 minutes to complete.

Complete anonymity is assured in this survey, as the questionnaire is anonymous. No questions are asked which would identify you as an individual. All responses will be aggregated for analysis only, and no personal details will be reported in the thesis or any resulting publications.

If you have any question about this survey, feel free to contact me on +64 224284908 or by email at dieuthuy.dang@gmail.com. You can also contact my supervisors Prof. Christopher Gan and Dr. Baiding Hu. Prof. Christopher Gan can be contacted at +64 3 4230227 or Christopher.Gan@lincoln.ac.nz; and Dr. Baiding Hu can be contacted at +64 3 4230231 or Baiding.Hu@lincoln.ac.nz.

Thank you for your kind co-operation and assistance.

Yours sincerely,

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Dr. Baiding Hu
Senior Lecturer
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This project has been reviewed and approved by the Lincoln University Human Ethics Committee.

ECONOMIC VALUES OF CLC MARINE PROTECTED AREA (MPA)

Questionnaire No.______________

Instructions: For each question with brackets provided, please tick your answer(s); otherwise, please follow the instructions given to answer the questions. Only summary measures and conclusions from this survey will be reported. Your participation is voluntary and all of your answers will be kept confidential.

Section 1: General information about your tourism activities in CLC MPA

1. Have you been to CLC MPA **before this trip**? (Tick one response only)
   1. Yes ☐
   2. No ☐ → **go to question 3**

2. How many trips have you taken to CLC MPA in last **5 years** (**excluding this trip**?) (Tick one response only)
   1. One trip ☐
   2. Two trips ☐
   3. Three trips and more ☐

3. What is your main purpose to CLC MPA in this trip? (Tick one or more responses)
   1. Vacation/holiday ☐
   2. Visiting relatives and/or friends ☐
   3. Business reasons ☐
   4. Culture ☐
   5. Study/research or education ☐
   6. Sports and recreation ☐
   7. Health ☐
   8. Religious reasons ☐
   9. Other, what ____________

4. Where did you get information on CLC MPA? (Tick one or more responses)
   1. Travel agency ☐
   2. Internet ☐
   3. Family/friends ☐
   4. Newspaper/magazines ☐
   5. Travel brochures ☐
   6. Travel guides ☐
   7. Media (TV/radio) ☐
   8. Tourist fairs ☐
   9. Other:________________

5. How important are the following motivations to you to visit CLC MPA? Please circle the suitable number from 1 to 5 where 1 indicates "**Not at all important**" and 5 indicates "**Most important**"

		Not at all important		Important		Most important
1	To experience natural tourism	1	2	3	4	5
2	To enjoy underwater sport activities	1	2	3	4	5
3	To learn about local plants and wildlife	1	2	3	4	5
4	To be close to nature in a unique place	1	2	3	4	5
5	To learn the local history/culture	1	2	3	4	5
6	To follow friends, family or colleagues	1	2	3	4	5
7	Spend less money than going to other MPAs such as Nha Trang, Phu Quoc, Cat Ba, Ly Son or Con Dao	1	2	3	4	5
8	Visiting CLC MPA included in the tour	1	2	3	4	5
9	To enjoy clean beaches and sun	1	2	3	4	5

6. How did you arrive to CLC MPA from your home? (Tick one response only)
   1. Flight and travel bus ☐
   2. By car ☐
   3. By bus ☐
   4. By motorbike ☐
   5. By train ☐
   6. Others, please specify_____________

7. How much did it cost you (or your group) to travel to CLC MPA from your home (including air, bus, train ticket, other tickets and fuel)? ________________ (VND)

8. How much time did you spend on traveling to CLC MPA from your home? _______ (days/hours)

9. If you stayed in CLC MPA more than 1 day, which of following accommodation did you choose? (Tick one response only)

1.	Homestay	☐	4.	None, just 1 day trip	☐
2.	Hotel	☐	5.	Others, please specify	_____________
3.	Camp	☐			

10. Which of the following activities have you taken part in or spent time doing during your visit to CLC MPA? (Tick one or more responses)

1. Coastal excursion and swimming ☐
2. Seeing spectacular sights of rare marine life & coral reefs ☐
3. Snorkelling & swimming in the seawater ☐
4. Visit local fishing villages in CLC MPA ☐
5. Enjoy fresh & delicious seafood lunch by the seaside ☐
6. Scuba-diving ☐
7. Sea trekking ☐
8. Others, please specify ___________________________________

11. How much time did you spent in CLC MPA **on this trip**? ___________ (days)

12. How long did you spend in contact with nature in CLC MPA **on this trip** (e.g. swimming, scuba-diving, snorkelling, camping on the beach, hiking and/or trekking)? (Tick one response only)

1.	None	☐	4.	From 8 to 12 hours	☐
2.	Less than 4 hours	☐	5.	More than 12 hours	☐
3.	From 4 to 8 hours	☐			

13. How many days did you spent on this trip (including in CLC MPA) _______ day(s)

14. Which places did you visit or are you going to visit **in this trip**, apart from CLC MPA? (Tick one or more responses)

1.	Hoi An	☐	4.	Hue	☐
2.	My Son Sanctuary	☐	5.	Others, please specify	_____________
3.	Da Nang	☐			

15. Including yourself, how many people in your group travel to CLC MPA? ________

16. What is approximate per-person expenses of your trip in CLC MPA (including for accommodation, meals, transportation, diving/snorkelling fees, souvenirs and/or others)? (Tick one response only)

1.	Less than 500,000 VND	☐	4.	2,000,000 VND – 4,000,000 VND	☐
2.	500,000 VND – 1,00,000 VND	☐	5.	4,000,000 VND – 8,000,000 VND	☐
3.	1,000,000 VND – 2,000,000 VND	☐	6.	Over 8,000,000 VND	☐

17. What did you LIKE or DISLIKE during your visit to CLC MPA? Please circle the suitable number from 1 to 5 where 1 indicates "**Dislike**" and 5 indicates "**Like**"

		Dislike		Neither like nor dislike		Like	Not engaged
1	Beaches and sun bath	1	2	3	4	5	0
2	More construction of luxury resorts/hotels	1	2	3	4	5	0
3	Fishing and squid fishing at night	1	2	3	4	5	0
4	Viewing seabed and/or boat excursion	1	2	3	4	5	0
5	Swimming and underwater sport activities	1	2	3	4	5	0
6	Hiking and/or trekking	1	2	3	4	5	0
7	Local culture and religious areas experience	1	2	3	4	5	0
8	The control of maximum number of visitors to CLC MPA at 1000 visitors per day	1	2	3	4	5	0
9	Tourists' awareness on rubbish dumping	1	2	3	4	5	0
10	Local cuisine and sea food	1	2	3	4	5	0
11	Marine museum tour	1	2	3	4	5	0
12	Tourist accommodation and facilities	1	2	3	4	5	0
13	Souvenirs and local crafts	1	2	3	4	5	0
14	Quality of boat and navigation transports	1	2	3	4	5	0

18. Please evaluate the quality of CLC MPA. Please circle the suitable number from 1 to 5 where 1 indicates "**Very poor**" and 5 indicates "**Very good**"

		Very Poor	Poor	Average	Good	Very good
1	Nature in general (marine and terrestrial)	1	2	3	4	5
2	Beaches	1	2	3	4	5
3	Management of restricted areas for marine and terrestrial conservation	1	2	3	4	5
4	Historical/cultural/religious sites	1	2	3	4	5
5	Tourist accommodation and facilities	1	2	3	4	5
6	Feeling of safety	1	2	3	4	5
7	Environmental sanitation in local villages	1	2	3	4	5
8	Food and shopping	1	2	3	4	5
9	Local ports environment	1	2	3	4	5
10	Sea turtle's spawning grounds	1	2	3	4	5

19. What is your opinion and perception of the tourism activities and environment in CLC MPA? Please circle the suitable number from 1 to 5 where 1 indicates "**Strongly disagree**" and 5 indicates "**Strongly agree**"

		Strongly disagree		Agree		Strongly agree
1	Wildlife and native plants are exploited for local socio-economic development	1	2	3	4	5
2	Number of waste and recycle bins are adequately placed in the CLC MPA	1	2	3	4	5
3	There should be more interacting activities with coral reef and nature	1	2	3	4	5
4	Coastal environment and natural resources should be fully used for tourists' enjoyment and relaxation	1	2	3	4	5
5	More fishing to meet tourists' demand	1	2	3	4	5
6	Eco-tourism helps to strengthen the marine conservation effort	1	2	3	4	5
7	Coastal areas and marine resources are important for the future of local people	1	2	3	4	5

		Strongly disagree		Agree		Strongly agree
8	More resorts/hotels should be constructed to supply increased number of tourists	1	2	3	4	5
9	More natural areas should be transferred to tourist entertainment areas	1	2	3	4	5

20. In general what do you seek the most when on an eco- holiday? Please list in order of importance using number 1 to 5 where number 1 indicates "**Less important**" and number 5 indicates "**Most important**"

		Less important		Neutral		Most important
1	Visiting un-crowded destinations	1	2	3	4	5
2	Experiencing remote and unspoiled nature	1	2	3	4	5
3	Increasing knowledge of wildlife	1	2	3	4	5
4	Interacting with native people	1	2	3	4	5
5	Supporting economic benefits to local communities	1	2	3	4	5
6	See unusual plants and animals	1	2	3	4	5
7	Experiencing nature friendly sports	1	2	3	4	5
8	Learning about nature creatures	1	2	3	4	5
9	Enjoy clean environment	1	2	3	4	5
10	Eco-tourism is a new form of tourism	1	2	3	4	5

21. What important activities should be undertaken in order to harmonize the natural resources conservation and environmental protection with local development? Please circle the suitable number from 1 to 5 where 1 indicates "**Less important**" and 5 indicates "**Most important**"

		Less important		Neutral		Most important
1	Improve waste collection and management	1	2	3	4	5
2	Improve protection and conservation of marine and terrestrial biodiversity	1	2	3	4	5
3	Improve water sewage treatment	1	2	3	4	5
4	Improve sand excavation management	1	2	3	4	5
5	Increase eco inspection and other forms of law enforcement	1	2	3	4	5
6	Increase local people participation into local environmental management and marine biodiversity conservation	1	2	3	4	5
7	Enhance eco-education for tourists	1	2	3	4	5
8	Fishing should be banned around the islands	1	2	3	4	5
9	New tourism facilities and new ports construction should be stopped	1	2	3	4	5
10	Increase in entrance fee to help improve conservation and environmental protection	1	2	3	4	5

22. How much do you currently know about sustainable practices? (Tick one response only)

1. I recognize terms or buzz words, but I don't have a full understanding of the issues ☐
2. I know what I hear on the news or read in mainstream media ☐
3. I seek out information on environmental and social issues of concern ☐

23. Do you understand the concept of sustainable tourism? Please mark the suitable number from 1 to 5 where 1 indicates "**strongly disagree**" and 5 indicates "**strongly agree**"

		Strongly disagree		Agree		Strongly agree
1	I understand the concept of sustainable tourism	1	2	3	4	5
2	I believe natural resource protection and tourism can be compatible	1	2	3	4	5
3	I believe protection of local heritage and tourism can be compatible?	1	2	3	4	5
4	I believe that well-managed attractions such as CLC MPA, maintained in their natural state, are important for tourism management	1	2	3	4	5
5	I believe the community would benefit from developing a sustainable tourism framework	1	2	3	4	5
6	I believe there is a demand for sustainable tourism in and around CLC MPA.	1	2	3	4	5
7	I believe a demand for sustainable tourism could be developed for CLC MPA	1	2	3	4	5
8	I believe the sustainable tourism may help to improve tourists' awareness on environmental protection in CLC MPA	1	2	3	4	5
9	I believe the sustainable tourism may have influence on improving community's environmental protection program	1	2	3	4	5

24. Have you ever participated in any environmental protection activities or events? (Tick one response only)

1. No ☐ 2. Yes ☐

If **Yes**, please specify ___________________

Next proceed to Section 2

Section 2: Willingness to pay for the conservation program in CLC MPA

25. How satisfy are you with the "amenities" in CLC MPA? Please circle the suitable number from 1 to 5 where 1 indicates "**Unsatisfied**" and 5 indicates "**Very satisfied**"

		Unsatisfied		Neutral		Very satisfie d
1	Beaches and scenes	1	2	3	4	5
2	Garbage collection and wastewater management	1	2	3	4	5
3	Tourism services and facilities	1	2	3	4	5
4	Eco-Tourism experience (e.g. natural friendly activities)	1	2	3	4	5
5	Cheap user fee and expenses	1	2	3	4	5
6	Cultural/ historical sites	1	2	3	4	5
7	Camping areas	1	2	3	4	5
8	Fresh air	1	2	3	4	5
9	Coral reef	1	2	3	4	5

26. What is your opinion of the following statements? Please circle the suitable number from 1 to 5 where 1 indicates "**strongly disagree**" and 5 indicates "**strongly agree**"

		Strongly disagree		Neutral		Strongly agree
1	I believe nature resource protection and tourism can be compatible	1	2	3	4	5
2	I believe protection of local heritage and culture, and tourism can be compatible	1	2	3	4	5
3	I believe that well-managed attractions such as CLC MPA should maintained their natural state, to attract tourism as well as for conservation	1	2	3	4	5
4	I believe the community would benefit from conservation program in CLC MPA	1	2	3	4	5
5	I believe there is a demand for sustainable tourism in CLC MPA and CLC-Hoi An Biosphere Reserve	1	2	3	4	5
6	I think we should protect nature resources	1	2	3	4	5
7	Environmental protection education for tourists should be operated	1	2	3	4	5

27. What is your perception on the relationship between tourism and conservation in CLC MPA? Please circle the suitable number from 1 to 5 where 1 indicates "**strongly disagree**" and 5 indicates "**strongly agree**"

		Strongly disagree		Neutral		Strongly agree
1	Tourism should contribute to the conservation of CLC MPA	1	2	3	4	5
2	Tourism poses a risk to the nature and environment in CLC MPA	1	2	3	4	5
3	Tourist fees charged by the MPA are an effective way to fund for conservation	1	2	3	4	5
4	It is important to protect CLC MPA even if tourists will never visit them	1	2	3	4	5
5	There is no interaction between tourism and conservation in CLC MPA	1	2	3	4	5
6	The development of eco-tourism will encourage local people participating in community-based conservation	1	2	3	4	5
7	The better conservation program in CLC MPA the more benefit getting from tourism	1	2	3	4	5
8	Tourism and conservation may be combined as sustainable tourism program.	1	2	3	4	5
9	The conservation program is the compulsory part of tourism	1	2	3	4	5

28. Do you know what is the entrance fee for CLC MPA? (Tick one response only)

1. Yes ☐ 2. No ☐

29. In your opinion, what is the most important value provided by CLC MPA? (Tick one response only)

1. Wildlife conservation ☐
2. Tourism ☐
3. Clean air and water ☐
4. Jobs and foreign exchange ☐
5. Local community development ☐
6. Others, please specify ____________

30. The recent entrance fee cost 70,000 VND per person. Can you kindly rate the entrance fee for CLC MPA? (Tick one response only)

1. Very cheap ☐
2. Cheap ☐
3. Affordable ☐
4. Expensive ☐
5. Very expensive ☐

31. Other than entrance fee, would you be willing to pay "additional" fee each time when you visit and use CLC MPA to contribute for the MPA management and conservation program? (Tick one response only)

1. Yes ☐
2. No ☐ → **Go to question 34**

32. What is your main motivation for your willingness to pay the additional fee? Please mark the suitable number from 1 to 5 where 1 indicates "**strongly disagree**" and 5 indicates "**strongly agree**"

		Strongly disagree		**Neutral**		**Strongly agree**
1	To conserve and preserve CLC MPA for future generation	1	2	3	4	5
2	I want better facilities	1	2	3	4	5
3	I feel responsible for the local communities	1	2	3	4	5
4	I get satisfaction from having paid to help preserve CLC MPA	1	2	3	4	5
5	To improve environmental quality in CLC MPA	1	2	3	4	5
6	I want to pay more for CLC MPA management and for using recreational areas	1	2	3	4	5
7	The entrance fee to CLC MPA is lower than that in other MPAs and coastal recreational sites	1	2	3	4	5
8	I want to contribute for local development	1	2	3	4	5
9	The beauty of CLC MPA deserves to be paid more for enjoying it	1	2	3	4	5
10	I do not think much about my motivation for willingness to pay	1	2	3	4	5

33. What is the additional **user fee** that you would be willing to pay **other than current entrance fee**? (Tick one response only)

1. 1.0 USD / 22,500 VND ☐
2. 1.5 USD / 34,000 VND ☐
3. 2.0 USD / 45,000 VND ☐
4. 2.5 USD / 56,000 VND ☐
5. 3.0 USD / 67,500 VND ☐
6. 3.5 USD / 79,000 VND ☐
7. 4.0 USD / 90,000 VND ☐
8. 4.5 USD / 101,500 VND ☐
9. 5.0 USD / 112,500 VND ☐
10. Over 5.0 USD / Over 112,500 VND ☐

→ **Go to question 35**

34. What is the main reason why you said "No" in **Question 31**? (Tick one or more responses)

1. The MPA already has fund for conservation program from the government, non-government organisations and/or donors ☐
2. I do not care about the conservation program of CLC MPA ☐
3. Polluters and fishermen should pay for the conservation program of CLC MPA ☐
4. It costs too much to visit the CLC MPA ☐
5. Don't trust that money will be used appropriately ☐
6. I am too poor ☐

7. Not tourists' responsibility ☐
8. Not enough information ☐
9. Others, please specify ____

35. If the authority wanted to conserve and preserve biodiversity in CLC MPA, AND increase the charge to **56,000VND (or about 2.5USD)** per person, would you be willing to pay to visit this MPA? (Tick one response only)

1. Yes ☐ → **Go to question 36** 2. No ☐ → **Go to question 37**

36. If **YES**, would you be willing to pay for more user fee to **112,000 VND** (or **about 4.97 USD**) per person to visit this MPA? (Tick one response only)

1. Yes ☐ 2. No ☐

→ **Go to question 38**

37. If **NO**, would you be willing to pay **28,000 VND (or about 1.24 USD)** per person to visit this MPA? (Tick one response only)?

1. Yes ☐ 2. No ☐

→ **Go to question 38**

Next proceed to Section 3

Section 3: Demographic Characteristics of Respondents

38. Are you from?

a. Local area (which city: …………………………………………………..)
b. Overseas (which country: ………………………………………………)

39. What is your gender? (Tick one response only)

1. Male ☐
2. Female ☐

40. Which is your age group? (Tick one response only)

1. 18 – 25 years ☐
2. 26 – 35 years ☐
3. 36 – 45 years ☐
4. 46 – 55 years ☐
5. 56 – 65 years ☐
6. 66 - 75 years ☐
7. Older than 75 years ☐

41. What is your highest educational or professional qualification? (Tick one response only)

1. No formal education ☐
2. Primary school ☐
3. Secondary school ☐
4. High school ☐
5. Three – year or under college diploma/certificate ☐
6. Bachelor degree ☐
7. Postgraduate degree (Postgraduate Diploma/ Master/ PhD) ☐
8. Other (Please specify) ____

42. What is your marital status? (Tick one response only)

1.	Single/Never married	☐	4.	De facto relationship	☐
2.	Engaged	☐	5.	Divorce/ Separated	☐
3.	Married	☐	6.	Widow/ Widower	☐

43. What is your occupation? (Tick one response only)

1. Civil Servant ☐
2. Manager/ Owner of business/ Self-employed ☐
3. Staff and professional (lawyer, scientist, engineer, teacher, doctor, etc.) ☐
4. Student ☐
5. Fishermen / Farmer ☐
6. Retired ☐
7. Unemployed /Homemaker ☐
8. Other (please specify) ____

44. What is your household's average monthly income (before taxes)? (**FOR VIETNAMESES ONLY**) (Tick one response only)

1. Below 5 million VND ☐
2. From 5 to below 10 million VND ☐
3. From 10 to below 15 million VND ☐
4. From 15 to below 20 million VND ☐
5. From 20 to below 25 million VND ☐
6. 25 million VND and above ☐

45. What is your household's average monthly income (before taxes)? (**FOR FOREIGN VISITORS ONLY**) (Tick one response only)

1. Below 2,000 USD ☐
2. From 2,000 to below 4,000 USD ☐
3. From 4,000 to below 6,000 USD ☐
4. From 6,000 to below 8,000 USD ☐
5. From 8,000 to below 10,000 USD ☐
6. 10,000 USD and above ☐

46. How many members are there in your household? __________________ (persons)

47. How many income earners are there in your household? _____________ (persons)

*Your participation in this survey is greatly appreciated. Thank you for your time and if you have further comments about this questionnaire, please feel free to comment in the space provided below. Once again, we assure you that your identity will remain **STRICTLY CONFIDENTIAL.***

Appendix B

Travel Cost Models Analysis

B.1 Zonal Travel Cost Model Analysis

B.1.1 Correlation and Collinearity Diagnostics in ZTCM Models

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) inc	1.000													
(2) hhsize	-0.463*	1.000												
	0.000													
(3) vne	-0.722*	0.511*	1.000											
	0.000	0.000												
(4) gender	0.042	-0.021	-0.005	1.000										
	0.352	0.635	0.912											
(5) age5	-0.019	0.057	0.014	0.008	1.000									
	0.673	0.201	0.754	0.853										
(6) professionals	0.161*	-0.043	-0.103*	0.062	-0.110*	1.000								
	0.000	0.332	0.020	0.162	0.014									
(7) retired	0.038	0.019	-0.042	0.066	0.417*	-0.115*	1.000							
	0.400	0.672	0.344	0.140	0.000	0.010								
(8) highschool	-0.124*	0.114*	0.083	-0.009	0.083	-0.120*	0.088*	1.000						
	0.005	0.010	0.062	0.841	0.064	0.007	0.049							
(9) timeCLC	0.272*	-0.128*	-0.175*	-0.051	-0.029	0.002	-0.011	-0.002	1.000					
	0.000	0.004	0.000	0.257	0.515	0.964	0.811	0.967						
(10) timetrip	0.404*	-0.360*	-0.609*	0.002	0.004	-0.008	0.115*	0.006	0.264*	1.000				
	0.000	0.000	0.000	0.963	0.923	0.850	0.010	0.899	0.000					
(11) homestay	0.045	-0.103*	-0.073	-0.052	-0.093*	-0.024	-0.016	-0.068	0.467*	0.227*	1.000			
	0.316	0.021	0.100	0.245	0.037	0.585	0.716	0.130	0.000	0.000				
(12) entrancefee	-0.141*	0.061	0.192*	0.006	-0.063	-0.092*	-0.074	-0.057	0.063	-0.012	0.088*	1.000		
	0.002	0.173	0.000	0.890	0.159	0.039	0.098	0.205	0.158	0.792	0.049			
(13) travelbus	-0.214*	0.102*	0.253*	-0.011	0.098*	-0.070	-0.004	0.163*	-0.061	-0.155*	-0.111*	0.035	1.000	
	0.000	0.022	0.000	0.802	0.028	0.119	0.925	0.000	0.174	0.000	0.012	0.438		
(14) train	-0.036	-0.009	0.038	-0.007	-0.016	-0.066	-0.014	0.013	-0.039	-0.024	-0.058	-0.042	-0.053	1.000
	0.425	0.841	0.395	0.873	0.717	0.140	0.754	0.779	0.382	0.592	0.192	0.344	0.232	

** shows significance at the 0.05 level*

B1.1 Correlation and Collinearity Diagnostics in ZTCM Models (continued)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(15) vacation	0.010	-0.089*	-0.070	0.021	0.049	-0.051	0.042	0.032	-0.155*	0.051	0.037	-0.102*	-0.074	0.024	1.000
	0.814	0.047	0.115	0.632	0.275	0.256	0.347	0.471	0.000	0.250	0.411	0.021	0.098	0.590	
(16) business	-0.072	0.120*	0.095*	-0.055	-0.040	0.109*	-0.035	-0.039	0.059	-0.060	-0.023	0.081	0.100*	-0.020	-0.497*
	0.105	0.007	0.033	0.216	0.364	0.015	0.434	0.379	0.188	0.180	0.602	0.070	0.025	0.654	0.000
(17) study	-0.063	0.066	0.082	-0.037	-0.035	0.038	-0.030	-0.041	0.029	-0.046	-0.008	0.134*	0.056	-0.017	-0.289*
	0.156	0.139	0.067	0.410	0.435	0.400	0.501	0.364	0.511	0.299	0.852	0.003	0.213	0.700	0.000
(18) sport	0.043	-0.026	-0.030	-0.001	-0.056	0.000	-0.006	0.056	0.032	0.059	-0.001	-0.023	-0.057	-0.042	-0.059
	0.338	0.553	0.501	0.979	0.213	0.992	0.900	0.209	0.472	0.186	0.983	0.605	0.204	0.347	0.187
(19) seafood	-0.003	0.024	0.030	0.002	-0.012	0.077	-0.133*	-0.135*	0.047	-0.041	0.056	0.043	-0.029	0.076	0.134*
	0.953	0.589	0.497	0.956	0.780	0.084	0.003	0.002	0.295	0.359	0.212	0.338	0.510	0.087	0.003
(20) seatrekking	-0.181*	0.129*	0.189*	-0.077	0.001	-0.059	0.008	0.014	-0.028	-0.168*	0.082	-0.014	0.074	0.039	-0.000
	0.000	0.004	0.000	0.084	0.984	0.185	0.862	0.756	0.536	0.000	0.067	0.759	0.096	0.377	0.995
(21) nattourism	-0.108*	0.120*	0.171*	0.110*	-0.012	-0.057	-0.042	-0.003	-0.133*	-0.201*	0.024	-0.072	0.090*	-0.006	0.142*
	0.015	0.007	0.000	0.014	0.786	0.204	0.350	0.952	0.003	0.000	0.585	0.106	0.042	0.894	0.001
(22) cheap	-0.054	-0.041	0.074	0.053	-0.042	-0.040	-0.036	-0.069	0.025	-0.035	0.103*	-0.029	-0.057	-0.021	0.027
	0.226	0.356	0.097	0.231	0.344	0.370	0.415	0.120	0.576	0.437	0.020	0.510	0.199	0.640	0.546
(23) nature	-0.124*	0.028	0.150*	-0.041	0.026	-0.020	-0.028	0.064	-0.050	-0.006	-0.037	0.043	0.035	-0.005	-0.017
	0.005	0.528	0.001	0.357	0.563	0.658	0.529	0.149	0.262	0.889	0.413	0.336	0.439	0.919	0.704
(24) qlty_beach	-0.018	0.006	0.045	-0.016	0.058	0.008	0.009	0.055	-0.060	0.038	-0.056	0.059	0.052	-0.057	0.032
	0.681	0.886	0.313	0.713	0.197	0.851	0.841	0.214	0.175	0.397	0.207	0.186	0.245	0.201	0.476
(25) nativepeople	0.133*	-0.106*	-0.163*	0.019	-0.053	-0.040	-0.056	-0.108*	0.076	0.160*	0.076	0.032	-0.008	0.063	-0.088*
	0.003	0.017	0.000	0.666	0.237	0.376	0.210	0.015	0.089	0.000	0.087	0.471	0.860	0.155	0.048
(26) cleanenv	0.160*	-0.068	-0.162*	0.018	0.093*	0.088*	-0.003	-0.032	-0.037	0.083	-0.032	0.000	-0.032	0.068	-0.025
	0.000	0.130	0.000	0.685	0.038	0.048	0.949	0.476	0.409	0.064	0.471	0.999	0.468	0.126	0.574
(27) val_wildlife	0.176*	-0.126*	-0.172*	-0.140*	0.018	0.050	-0.026	-0.024	0.056	0.094*	0.033	-0.031	-0.072	-0.063	-0.047
	0.000	0.005	0.000	0.002	0.694	0.258	0.555	0.586	0.210	0.035	0.457	0.485	0.107	0.160	0.291
(28) val_tourism	-0.174*	0.110*	0.210*	0.133*	0.009	-0.085	0.072	0.095*	-0.043	-0.153*	0.005	-0.087	0.057	0.091*	0.085
	0.000	0.013	0.000	0.003	0.838	0.057	0.104	0.033	0.335	0.001	0.907	0.050	0.199	0.042	0.058
(29)val_cleanairwater	-0.108*	0.078	0.100*	0.034	0.029	0.008	-0.058	0.013	-0.040	-0.075	-0.087	0.113*	0.029	0.001	-0.013
	0.015	0.080	0.025	0.452	0.518	0.862	0.190	0.777	0.372	0.094	0.051	0.011	0.512	0.978	0.772
(30) Ln(TC1)	0.332*	-0.155*	-0.324*	-0.004	-0.048	0.082	0.015	-0.049	0.288*	0.190*	0.273*	-0.222*	-0.307*	-0.081	0.108*
	0.000	0.000	0.000	0.925	0.286	0.067	0.735	0.276	0.000	0.000	0.000	0.000	0.000	0.069	0.015
(31) Ln(TC2)	0.469*	-0.235*	-0.438*	-0.002	-0.050	0.099*	0.025	-0.068	0.359*	0.280*	0.304*	-0.224*	-0.329*	-0.085	0.101*
	0.000	0.000	0.000	0.958	0.263	0.026	0.570	0.129	0.000	0.000	0.000	0.000	0.000	0.058	0.024

** shows significance at the 0.05 level*

B1.1 Correlation and Collinearity Diagnostics in ZTCM Models (continued)

Variables	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)
(16) business	1.000															
(17) study	0.158*	1.000														
	0.000															
(18) sport	-0.057	0.021	1.000													
	0.205	0.641														
(19) seafood	-0.031	-0.024	0.048	1.000												
	0.484	0.594	0.283													
(20) seatrekking	-0.008	0.053	-0.074	0.025	1.000											
	0.864	0.239	0.096	0.580												
(21) nattourism	-0.082	-0.051	0.065	0.113*	0.083	1.000										
	0.065	0.249	0.146	0.011	0.063											
(22) cheap	-0.010	0.003	-0.016	0.021	-0.017	0.017	1.000									
	0.822	0.938	0.717	0.640	0.706	0.707										
(23) nature	0.003	0.131*	0.060	0.175*	0.063	0.062	-0.112*	1.000								
	0.946	0.003	0.177	0.000	0.161	0.164	0.012									
(24) qlty_beach	-0.010	0.066	0.075	0.108*	0.031	0.086	-0.030	0.475*	1.000							
	0.816	0.138	0.094	0.015	0.491	0.053	0.497	0.000								
(25) nativepeople	0.048	0.066	-0.000	0.136*	-0.004	0.087	-0.026	0.057	0.055	1.000						
	0.287	0.138	0.995	0.002	0.931	0.051	0.559	0.201	0.218							
(26) cleanenv	-0.004	0.061	0.027	0.143*	-0.177*	-0.021	-0.086	0.085	0.055	0.055	1.000					
	0.927	0.172	0.552	0.001	0.000	0.643	0.053	0.056	0.220	0.219						
(27) val_wildlife	-0.018	-0.021	0.066	-0.018	-0.127*	-0.113*	-0.049	0.007	-0.027	0.063	-0.006	1.000				
	0.688	0.636	0.138	0.694	0.004	0.011	0.273	0.878	0.543	0.159	0.900					
(28) val_tourism	-0.020	-0.076	0.007	-0.028	0.126*	0.162*	-0.030	0.041	-0.027	-0.057	-0.145*	-0.448*	1.000			
	0.661	0.089	0.871	0.526	0.005	0.000	0.497	0.363	0.541	0.203	0.001	0.000				
(29)val_cleanairwater	0.068	0.065	-0.099*	0.096*	0.041	-0.007	0.097*	0.054	0.113*	-0.020	0.145*	-0.398*	-0.363*	1.000		
	0.126	0.146	0.027	0.032	0.356	0.868	0.029	0.229	0.011	0.650	0.001	0.000	0.000			
(30) Ln(TC1)	-0.066	-0.080	0.116*	0.079	-0.085	0.124*	0.035	0.033	0.098*	0.075	0.010	-0.053	0.059	-0.073	1.000	
	0.136	0.071	0.009	0.076	0.055	0.005	0.431	0.457	0.027	0.094	0.822	0.237	0.189	0.100		
(31) Ln(TC2)	-0.076	-0.086	0.112*	0.075	-0.109*	0.089*	0.029	0.003	0.084	0.099*	0.032	-0.020	0.022	-0.090*	0.983*	1.000
	0.090	0.054	0.012	0.094	0.014	0.047	0.509	0.944	0.061	0.027	0.474	0.652	0.625	0.044	0.000	

** shows significance at the 0.05 level*

B.1.2 Variance Inflation Factor

Model 1			Model 2		
	VIF	1/VIF		VIF	1/VIF
vne	3.398	.294	vne	3.419	.293
val_tourism	2.537	.394	inc	2.556	.391
inc	2.472	.405	val_tourism	2.537	.394
val_wildlife	2.437	.41	val_wildlife	2.443	.409
val_cleanairwater	2.35	.425	val_cleanairwater	2.352	.425
timetrip	1.914	.522	Ln(TC2)	1.94	.516
timeCLC	1.609	.621	timetrip	1.909	.524
Ln(TC1)	1.603	.624	timeCLC	1.642	.609
vacation	1.582	.632	vacation	1.582	.632
homestay	1.521	.657	homestay	1.535	.652
hhsize	1.478	.677	hhsize	1.477	.677
nature	1.449	.69	nature	1.448	.69
business	1.4	.714	business	1.4	.714
qlty_beach	1.371	.729	qlty_beach	1.373	.729
retired	1.296	.772	retired	1.296	.771
age5	1.287	.777	age5	1.287	.777
travelbus	1.246	.803	travelbus	1.253	.798
seafood	1.222	.818	seafood	1.224	.817
entrancefee	1.208	.828	entrancefee	1.209	.827
nattourism	1.189	.841	nattourism	1.189	.841
cleanenv	1.175	.851	cleanenv	1.175	.851
study	1.15	.87	study	1.15	.87
cheap	1.144	.874	cheap	1.145	.874
highschool	1.139	.878	highschool	1.139	.878
nativepeople	1.132	.883	nativepeople	1.132	.883
professionals	1.129	.885	professionals	1.13	.885
seatrekking	1.09	.917	seatrekking	1.09	.917
gender	1.086	.921	gender	1.087	.92
sport	1.074	.931	sport	1.074	.931
train	1.067	.937	train	1.068	.937
Mean VIF	1.525	.	Mean VIF	1.542	.

B.1.3. Normality Tests

Jarque-Bera normality test:

Model 1	Model 2
Chi(2) 5.76	Chi(2) 5.34
Prob>chi2 0.0561	Prob>chi2 0.0693
Jarque-Bera test for Ho: normality	Jarque-Bera test for Ho: normality

Skewness/Kurtosis tests for Normality

	Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj_chi2(2)	Prob>chi2
Model 1	Residuals	504	0.118	0.083	5.450	0.066
Model 2	Residuals	504	0.136	0.091	5.09	0.079

Shapiro-Wilk W test for normal data

Ho: normality

	Variable	Obs	W	V	z	Prob>z
Model 1	Residuals	504	0.994	1.956	1.613	0.053
Model 2	Residuals	504	0.995	1.801	1.415	0.079

B.1.4. Heteroskedasticity Tests

White's test for Ho: homoskedasticity

against Ha: unrestricted heteroskedasticity

Model 1	Model 2
chi2(383) = 417.33	chi2(383) = 415.28
Prob > chi2 = 0.1095	Prob > chi2 = 0.1232

Cameron & Trivedi's decomposition of IM-test

	Model 1			Model 2		
Source	chi2	df	p	chi2	df	p
Heteroskedasticity	417.330	383	0.110	415.28	383	0.123
Skewness	30.960	30	0.417	31.87	30	0.374
Kurtosis	2.260	1	0.133	2.16	1	0.142
Total	450.560	414	0.104	449.31	414	0.112

Breusch-Pagan / Cook-Weisberg test

Ho: Constant variance

Model 1	Model 2
Variable: Fitted Values of Ln(VR)	
chi2(1) = 3.86	chi2(1) = 3.03
Prob > chi2 = 0.0494	Prob > chi2 = 0.0820
Variables: All Independent Variables	
chi2(30) = 47.72	chi2(30) = 47.53
Prob > chi2 = 0.0211	Prob > chi2 = 0.0221

B.1.5. Tests for Model Specification

Model 1:

Ramsey RESET test using powers of the fitted values of Ln(VR)

Ho: model has no omitted variables

F(3, 470) = 1.76

Prob > F = 0.1542

Source	SS	df	MS			
				Number of obs	=	504
				F(2, 501)	=	745.17
Model	1397.99995	2	698.999975	Prob > F	=	0.0000
Residual	469.960829	501	.938045567	R-squared	=	0.7484
				Adj R-squared	=	0.7474
Total	1867.96078	503	3.71363972	Root MSE	=	.96853

ln_VR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.978283	.0307924	31.77	0.000	.9177848	1.038781
_hatsq	.0186079	.0142455	1.31	0.192	-.0093804	.0465962
_cons	-.0745133	.0859375	-0.87	0.386	-.2433557	.0943291

Model 2:

Ramsey RESET test using powers of the fitted values of Ln(VR)

Ho: model has no omitted variables

F(3, 470) = 1.34

Prob > F = 0.2613

Source	SS	df	MS			
				Number of obs	=	504
				F(2, 501)	=	734.66
Model	1392.98853	2	696.494265	Prob > F	=	0.0000
Residual	474.972248	501	.948048399	R-squared	=	0.7457
				Adj R-squared	=	0.7447
Total	1867.96078	503	3.71363972	Root MSE	=	.97368

ln_VR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.9844892	.0314989	31.25	0.000	.922603	1.046375
_hatsq	.0129433	.0147216	0.88	0.380	-.0159803	.041867
_cons	-.0509795	.086857	-0.59	0.558	-.2216283	.1196693

B.2 Individual Travel Cost Model Analysis

B2.1 Over-Dispersion Test for Count Models

The score test was used to examine over dispersion in count models. The result from the general Poisson regression shows whether the Poisson or Negative Binomial regression should be chosen for ITCM models. We used one-sided score test, setting the significance level at *p-values <0.05*. If *z* score is higher than 1 and *p-values <0.05*, the null hypothesis will be rejected (Ho: no over-dispersion).

The Poisson regression and score test (z score) of Model 1

visit	Coef.	S.E.	t-value	p-value	95% Confidence Interval		Sig
TC00	0.001	0.000	1.45	0.146	0.000	0.002	
timecost	-0.004	0.003	-1.33	0.183	-0.009	0.002	
onsitecost	0.000	0.000	1.04	0.300	0.000	0.000	
timeNAT	-0.022	0.037	-0.61	0.540	-0.094	0.049	
postgrad	0.140	0.203	0.69	0.491	-0.258	0.539	
Constant	0.771	0.395	1.95	0.051	-0.002	1.545	*

Mean dependent var	1.591	SD dependent var	0.959
Pseudo r-squared	0.054	Number of obs	22.000
Chi-square	.	Prob > chi2	.
Akaike crit. (AIC)	67.476	Bayesian crit. (BIC)	72.931

**** p<0.01, ** p<0.05, * p<0.1*

z	Coef.	S.E.	t-value	p-value	95% Confidence Interval		Sig
Constant	-0.475	0.072	-6.60	0.000	-0.624	-0.325	***

Mean dependent var	-0.475	SD dependent var	0.337
R-squared	0.000	Number of obs	22.000
F-test	0.000	Prob > F	.
Akaike crit. (AIC)	15.580	Bayesian crit. (BIC)	16.671

**** p<0.01, ** p<0.05, * p<0.1*

The Poisson regression and score test (z score) of Model 2

visit	Coef.	S.E.	t-value	p-value	95% Confidence Interval		Sig
TC00	0.000	0.000	-2.27	0.023	0.000	0.000	**
timecost	0.000	0.000	6.01	0.000	0.000	0.000	***
onsitecost	0.000	0.000	1.05	0.292	0.000	0.000	
timeNAT	-0.015	0.008	-1.99	0.047	-0.030	0.000	**
postgrad	0.229	0.098	2.33	0.020	0.037	0.422	**
rel_visit	0.507	0.164	3.10	0.002	0.186	0.829	***
business	0.585	0.095	6.19	0.000	0.400	0.770	***
occupation	0.464	0.177	2.62	0.009	0.116	0.811	***
danang	-0.182	0.054	-3.37	0.001	-0.289	-0.076	***
vne	0.347	0.058	6.00	0.000	0.233	0.460	***
Constant	0.139	0.073	1.90	0.058	-0.005	0.282	*

Mean dependent var	1.396	SD dependent var	0.813
Pseudo r-squared	0.042	Number of obs	505.000
Chi-square	2226.891	Prob > chi2	0.000
Akaike crit. (AIC)	1265.253	Bayesian crit. (BIC)	1311.723

**** p<0.01, ** p<0.05, * p<0.1*

z	Coef.	S.E.	t-value	p-value	95% Confidence Interval		Sig
Constant	-0.488	0.015	-32.41	0.000	-0.518	-0.458	***

Mean dependent var	-0.488	SD dependent var	0.338
R-squared	0.000	Number of obs	505.000
F-test	0.000	Prob > F	.
Akaike crit. (AIC)	339.796	Bayesian crit. (BIC)	344.020

**** p<0.01, ** p<0.05, * p<0.1*

The Poisson regression and score test (z score) of Model 3

visit	Coef.	S.E.	t-value	p-value	95% Confidence Interval		Sig
TC00	0.001	0.000	3.92	0.000	0.000	0.001	***
timecost	0.000	0.000	6.01	0.000	0.000	0.000	***
onsitecost	0.000	0.000	1.10	0.270	0.000	0.000	
timeNAT	-0.015	0.008	-2.02	0.044	-0.030	0.000	**
postgrad	0.228	0.098	2.33	0.020	0.036	0.421	**
rel_visit	0.499	0.165	3.02	0.003	0.175	0.822	***
business	0.586	0.095	6.17	0.000	0.400	0.772	***
occupation	0.458	0.177	2.59	0.010	0.111	0.804	**
danang	-0.193	0.058	-3.34	0.001	-0.306	-0.080	***
vne	0.352	0.060	5.90	0.000	0.235	0.469	***
MD	0.123	0.120	1.03	0.305	-0.112	0.359	
MD_tc	-0.001	0.000	-4.08	0.000	-0.001	0.000	***
Constant	0.021	0.139	0.15	0.877	-0.250	0.293	

Mean dependent var	1.396	SD dependent var	0.813
Pseudo r-squared	0.042	Number of obs	505
Chi-square	2229.040	Prob > chi2	0.000
Akaike crit. (AIC)	1268.785	Bayesian crit. (BIC)	1323.704

**** p<0.01, ** p<0.05, * p<0.1*

Z	Coef.	S.E.	t-value	p-value	95% Confidence Interval		Sig
Constant	-0.489	0.015	-32.25	0.000	-0.519	-0.459	***

Mean dependent var	-0.489	SD dependent var	0.341
R-squared	0.000	Number of obs	505
F-test	0.000	Prob > F	.
Akaike crit. (AIC)	346.119	Bayesian crit. (BIC)	350.344

**** p<0.01, ** p<0.05, * p<0.1*

B2.2 Model Specification Tests

Model 1:

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	22	-25.35065	-18.66595	6	49.33189	55.87815

Note: BIC uses N = number of observations.

```
Zero-truncated Poisson regression                Number of obs     =        22
                                                 LR chi2(2)        =     13.37
                                                 Prob > chi2       =    0.0012
Log likelihood = -18.665041                      Pseudo R2         =    0.2637
```

visit	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	1.005906	.4775856	2.11	0.035	.0698559	1.941957
_hatsq	.0140771	.3253537	0.04	0.965	-.6236044	.6517586
_cons	-.0086533	.3734951	-0.02	0.982	-.7406902	.7233836

Model 2:

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	505	-504.9166	-356.5674	11	735.1348	781.605

```
Zero-truncated Poisson regression                Number of obs     =       505
                                                 LR chi2(2)        =    296.94
                                                 Prob > chi2       =    0.0000
Log likelihood = -356.44456                      Pseudo R2         =    0.2941
```

visit	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	.9973531	.0851712	11.71	0.000	.8304206	1.164286
_hatsq	-.0390847	.0816703	-0.48	0.632	-.1991556	.1209862
_cons	.0245944	.083112	0.30	0.767	-.1383021	.1874908

Model 3:

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	505	-504.9166	-355.6661	13	737.3321	792.2514

Zero-truncated Poisson regression

Number of obs	=	505
LR chi2(2)	=	298.74
Prob > chi2	=	0.0000
Pseudo R2	=	0.2958

Log likelihood = -355.54773

visit	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	.9976652	.0846633	11.78	0.000	.8317282	1.163602
_hatsq	-.0380805	.081051	-0.47	0.638	-.1969375	.1207764
_cons	.0242383	.0832621	0.29	0.771	-.1389524	.187429

Appendix C

Generalised Linear Model (GLM) Analysis

C.1 Correlation and Collinearity Diagnostics of GLM

Model 1 (observations = 394)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) inc	1.000								
(2) ef_rating	-0.278*	1.000							
	0.000								
(3) manager	-0.044	0.019	1.000						
	0.388	0.710							
(4) secondary	-0.047	0.045	0.005	1.000					
	0.353	0.377	0.925						
(5) qlty.beach	-0.030	-0.077	0.051	0.006	1.000				
	0.552	0.125	0.316	0.900					
(6) env_act	-0.016	0.039	-0.003	-0.097	-0.102*	1.000			
	0.755	0.445	0.948	0.054	0.044				
(7) valueCLC	0.018	0.035	-0.040	-0.013	-0.121*	0.009	1.000		
	0.723	0.489	0.429	0.802	0.016	0.862			
(8) ef_increase	0.068	-0.053	0.014	-0.031	-0.021	-0.009	0.036	1.000	
	0.178	0.290	0.784	0.534	0.679	0.853	0.479		
(9) eco_edu	0.167*	-0.071	-0.098	0.036	0.020	0.089	-0.006	0.026	1.000
	0.001	0.161	0.051	0.478	0.698	0.077	0.898	0.600	

* shows significance at the 0.05 level

Model 2 (observations = 325)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) inc	1.000								
(2) ef_rating	-0.126*	1.000							
	0.023								
(3) manager	0.066	-0.009	1.000						
	0.232	0.868							
(4) secondary	-0.087	0.042	0.012	1.000					
	0.118	0.447	0.836						
(5) qlty.beach	-0.017	-0.118*	0.066	0.007	1.000				
	0.756	0.033	0.236	0.901					
(6) env_act	-0.033	-0.022	0.033	-0.108	-0.125*	1.000			
	0.552	0.692	0.548	0.051	0.024				
(7) valueCLC	-0.047	0.021	-0.032	-0.010	-0.019	-0.052	1.000		
	0.395	0.707	0.569	0.852	0.727	0.346			
(8) ef_increase	-0.012	0.052	0.001	-0.038	0.005	-0.034	0.030	1.000	
	0.834	0.353	0.990	0.494	0.935	0.539	0.595		
(9) eco_edu	-0.037	-0.036	-0.066	0.057	0.054	0.095	-0.066	0.008	1.000
	0.503	0.515	0.232	0.306	0.334	0.086	0.235	0.890	

* shows significance at the 0.05 level

Model 3 (observations = 69)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) inc	1.000								
(2) ef_rating	-0.055	1.000							
	0.656								
(3) manager	-0.074	0.059	1.000						
	0.546	0.631							
(4) secondary	-0.054	-0.017	-0.061	1.000					
	0.661	0.892	0.617						
(5) qlty_beach	0.056	-0.081	-0.031	-0.018	1.000				
	0.645	0.508	0.804	0.881					
(6) env_act	0.311*	0.026	-0.243*	-0.077	-0.056	1.000			
	0.009	0.833	0.044	0.527	0.648				
(7) valueCLC	-0.046	0.127	-0.061	-0.015	-0.325*	0.190	1.000		
	0.707	0.298	0.617	0.905	0.006	0.118			
(8) ef_increase	0.057	-0.316*	0.102	0.043	-0.107	0.192	0.043	1.000	
	0.640	0.008	0.405	0.726	0.383	0.114	0.726		
(9) eco_edu	0.199	0.064	-0.238*	-0.057	-0.071	0.218	0.094	0.051	1.000
	0.102	0.601	0.049	0.641	0.562	0.072	0.440	0.676	

* shows significance at the 0.05 level

C.2 Model Specification Tests

Model 1:

```
Akaike's information criterion and Bayesian information criterion

-----------------------------------------------------------------------------
       Model |          N   ll(null)  ll(model)      df         AIC        BIC
-------------+---------------------------------------------------------------
           . |        394          .  -686.2137      10    1392.427   1432.191
-----------------------------------------------------------------------------


Generalized linear models                         Number of obs   =        394
Optimization     : ML                             Residual df     =        391
                                                  Scale parameter =   1.638775
Deviance         =  640.7611053                   (1/df) Deviance =   1.638775
Pearson          =  640.7611053                   (1/df) Pearson  =   1.638775

Variance function: V(u) = 1                       [Gaussian]
Link function    : g(u) = u                       [Identity]

                                                  AIC             =   3.339411
Log likelihood   = -654.8640222                   BIC             =  -1695.992

------------------------------------------------------------------------------
             |                 OIM
     bid_pc2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        _hat |   2.068788   .5549266     3.73   0.000     .9811522    3.156425
      _hatsq |   .1677043   .2908517     0.58   0.564    -.4023546    .7377633
       _cons |   .5954379   .2409332     2.47   0.013     .1232174    1.067658
------------------------------------------------------------------------------
```

Model 2:

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	325	.	-532.4659	9	1082.932	1116.986

```
Generalized linear models                    Number of obs   =        325
Optimization     : ML                        Residual df     =        322
                                             Scale parameter =   1.284311
Deviance         =  413.5480526              (1/df) Deviance =   1.284311
Pearson          =  413.5480526              (1/df) Pearson  =   1.284311

Variance function: V(u) = 1                  [Gaussian]
Link function    : g(u) = u                  [Identity]

                                             AIC             =   3.097287
Log likelihood   = -500.3091602              BIC             =  -1448.844
```

bid_pc2	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	1.561008	.6065153	2.57	0.010	.3722601	2.749756
_hatsq	.297131	.410529	0.72	0.469	-.507491	1.101753
_cons	.8378536	.2140427	3.91	0.000	.4183377	1.257369

Model 3:

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
.	69	.	-147.4239	8	310.8477	328.7206

```
Generalized linear models                    Number of obs   =         69
Optimization     : ML                        Residual df     =         66
                                             Scale parameter =   2.450579
Deviance         =     161.7382              (1/df) Deviance =   2.450579
Pearson          =     161.7382              (1/df) Pearson  =   2.450579

Variance function: V(u) = 1                  [Gaussian]
Link function    : g(u) = u                  [Identity]

                                             AIC             =   3.776706
Log likelihood   = -127.2963591              BIC             =  -117.7128
```

bid_pc2	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	2.027039	.7091708	2.86	0.004	.6370901	3.416988
_hatsq	.1565232	.3522965	0.44	0.657	-.5339653	.8470117
_cons	.9170023	.4539788	2.02	0.043	.0272203	1.806784

C.3 Marginal Effects of GLM

Model 1:

Marginal effects after glm
y = Predicted mean WTP (predict)

Variable	dy/dx	S.E.	z	P>z	95%C.I.	
inc	1.505e-04	7.17e-05	2.100	0.036	9.96e-06	0.0002911
ef_rating	-0.844	0.091	-9.310	0.000	-1.022	-0.666
manager*	0.365	0.158	2.310	0.021	0.055	0.676
secondary*	-0.713	0.249	-2.860	0.004	-1.201	-0.225
qlty_beach	0.019	0.093	0.200	0.838	-0.164	0.202
env_act*	0.257	0.129	1.980	0.047	0.003	0.511
valueCLC*	-0.682	0.683	-1.000	0.318	-2.020	0.657
ef_increase	0.140	0.070	2.010	0.044	0.004	0.277
eco_edu	0.163	0.078	2.080	0.037	0.010	0.316

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Model 2:

Marginal effects after glm
y = Predicted mean WTP (predict)

Variable	dy/dx	S.E.	z	P>z	95% C.I.	
inc	0.00236	0.00063	3.740	0.000	0.001124	0.003601
ef_rating	-0.738	0.101	-7.330	0.000	-0.935	-0.541
manager*	0.255	0.142	1.800	0.071	-0.022	0.533
secondary*	-0.404	0.251	-1.610	0.108	-0.896	0.089
qlty_beach	-0.045	0.089	-0.500	0.614	-0.219	0.130
env_act*	0.312	0.125	2.500	0.012	0.067	0.556
valueCLC*	0.455	0.140	3.240	0.001	0.179	0.730
ef_increase	0.125	0.066	1.880	0.060	-0.005	0.255
eco_edu	0.082	0.071	1.160	0.247	-0.057	0.222

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Model 3:

Marginal effects after glm
y = Predicted mean WTP (predict)

Variable	dy/dx	S.E.	z	P>z	95% C.I.	
inc	-9.45e-05	0.00011	-0.850	0.395	-0.00031	0.00012
ef_rating	-1.050	0.246	-4.270	0.000	-1.532	-0.568
manager*	0.490	0.664	0.740	0.461	-0.812	1.792
secondary*	-2.666	0.221	-12.070	0.000	-3.098	-2.233
qlty_beach	0.754	0.318	2.370	0.018	0.131	1.377
env_act*	0.316	0.540	0.580	0.559	-0.743	1.375
valueCLC*	-2.372	0.337	-7.030	0.000	-3.033	-1.711
ef_increase	0.488	0.229	2.130	0.033	0.040	0.937
eco_edu	0.946	0.393	2.410	0.016	0.175	1.717

(*) dy/dx is for discrete change of dummy variable from 0 to 1

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