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Willingness-to-pay or contribute labor to manage Marine Invasive Alien Species(sargassum): A case study in Ghana.

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ABSTRACT

The current study examines the willingness to pay or contribute labour hours in the control Sargassum invasion in Ghana. The main objective of the study was to estimate how much money or labour hours respondents were willing to offer for the Sargassum invasion in Ghana. We also estimate the determinants for willingness to pay decisions and the amount to pay. Using the contingent valuation method, we conducted interviews with 528 respondents in the western and central coastal regions of Ghana. The studies estimate an amount of Gh¢52 and 5 working days (7.5 hrs daily) as the average annual amount of money and time people are willing to pay for the control of Sargassum. We also found that both willingness to pay (money) and willingness to pay(time) decisions are influenced by either the employment status or educational level of the respondent. We also estimated that males and households with minors are willing to contribute labour hours' time) in the control of Sargassum while highly educated respondents are willing to contribute fewer hours. Full-time and part-time employed respondents have a high willingness to pay (money) decisions and similar results were found for households with lower educational attainment. The current study adds to the stock of knowledge on marine invasive species with specific emphasis on the Sargassum invasion in Ghana. We recommend that given the dynamics of socioeconomic factors in influencing willingness to pay decisions, policymakers must understand the dynamics and make policies more targeted to achieve meaningful results.

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CHAPTER ONE

1.0 Introduction

Humans have been spreading plants, animals, and other species all over the world for hundreds of years, in a sluggish process of globalization.

With modern trade, travel, and technology, the rate of this process has accelerated, and biological invasions have become a result of globalization. Through planned or unintentional introductions, globalization encourages and amplifies the spread of Invasive Alien Species (IAS), which is described as "foreign species whose introduction causes or is expected to cause, economic or environmental impact or harm to human health." (Meyerson & Mooney, 2007).

Dating back to the early 1970s there have been records of the growth of dangerous algal species in marine and freshwater bodies in the Northern Americas and Europe, but there has been a higher increase as of the 1990s (Lopez et. al.,2008). According to Gower (2013), a large amount of Sargassum had been invading the shorelines of America and West Africa, since 2011.

Sargassum muticum known as Sargassum or the Japanese seaweed originates from Japan, due to globalization it was transported by sea with the Japanese oysters to other regions. Due to its invasiveness, it thrives in humid and temperate regions, showing its tolerance to any environment. There has been a recording of the presence of Sargassum on many continents and many ocean shores.

Studies have been done on the types of seaweed found on the coast of Ghana's shore and how seaweed's presence improves the life of indigenes and the people whose economic activities are based mostly on the sea and its related benefits that include but are not limited to fishing and recreation. However, the Sargassum invasion has jeopardized the survival of coastal towns by harming coastal fisheries, tourism, and human health (Ofori & Rouleau, 2022). The massive inflow of Sargassum in West Africa and the Caribbean since 2011 has jeopardized the viability of marine ecosystems and coastal habitats. Sargassum invasions have killed fishes and endangered marine turtles, as well as lowered sunshine and oxygen levels in coastal habitats (Benante,2016).

Marine fishers' operations have grown less productive because of floating seaweeds on the sea and mounts of rotten seaweeds on the shore, fishers commonly capture seaweeds instead of fish and thereby spend valuable hours cleaning trapped seaweeds from their fishing nets. (Ackah-Baidoo, 2013).

Furthermore, Ackah-Baidoo (2013), stated that beach pollution caused by mounds of decaying fish entangled by Sargassum washed ashore has affected coastal tourism. Sargassum on the seashore emits disagreeable scents and deadly hydrogen sulfide that is hazardous to human health and causes eye and skin irritation.

This study uses a contingent valuation approach to source information from both fisherfolks and people whose livelihood depends on the sea or shore on their willingness to pay or willingness to contribute labour to reduce the impacts of Sargassum on the ecosystem.

1.1 Problem Statement

The Sargassum invasion has been reported in most parts of the world with a large literature on its invasion and control. Louime et.al., (2017) in the paper titled "Sargassum Invasion of Coastal Environments: A Growing Concern" investigated the causes of the recent occurrence of Sargassum in the Caribbean, the movement of Sargassum to the west coast of Africa and remedies to control them.

In the West African sub-region, there have been reports of Sargassum on various coasts, of which Ghana is not an exception. This species has detrimental effects on livelihoods and the environment, including, among other things, fig. 1.1.1 and fig. 1.1.2 below.

The Ghana Environmental Protection Agency (EPA) proposed a Sargassum clean-up exercise in which municipalities were directed to do periodic clean-up of Sargassum from the beaches and inshore. The failure of the policy has been due to a lack of funding from the central government for the clean-up exercise. There is therefore the need to think of other ways of making the management of Sargassum effective since its impact on the affected communities cannot be underestimated. In the context of developing countries, a combination of willingness to pay (WTP)-money and labour hours is likely to be an alternative means of controlling the Sargassum invasion. In a study conducted by Brouwer et.al, (2009) using two-phased contingent valuation to assess willingness to pay to reduce flood risk in Bangladesh about 75% of the population was willing to pay in kind rather than in monetary terms. The study was conducted after six months using both monetary and non-monetary payment methods and the values obtained for willingness to pay (WTP)were reliable.

Also, Ahlheim et. al, (2017) found that individuals stated WTP in developing countries was exceptionally low because of very tight budgets or poverty, this makes it difficult for people to show how much they appreciate an environmental resource in terms of their willingness to pay. They suggested that labour in situations of abject poverty or in third-world countries.

Furthermore, Vondolia and Navrud (2019), conducted a split-sample design choice experiment in a developing country concerning flood insurance. During this experiment, participants were offered the option to pay insurance premiums using money, labour time, or harvests. The study revealed that the relative scale parameters for non-monetary payment modes were lower than those for the monetary payment mode. Additionally, the two non-monetary payment methods showed higher levels of uncertainty during the experiment.

Vondolia et.al, (2014) examined how payment vehicles influence responses in developing countries, using both monetary and non-monetary payment vehicles, and the acceptance rate had reduced irregularities.

Based on this study and a few more conducted in developing countries informed our decision to use both labour and monetary approach to help control the Sargassum invasion.

The current study seeks to use a non-market valuation method to elicit responses from the Sargassum-invaded communities in Ghana and use them to generate estimates on the average amount and hours that households are willing to pay or contribute respectively for controlling the Sargassum invasion in Ghana.

Fig.1.1.1 A beach on the western coast of Ghana with a heap of Sargassum washed ashore. Photo credit EPA Ghana website

Fig.1.1.2 Fishermen with a catch full of Sargassum

1.2 Objectives of the Study

The main objective of the current study is to contribute to the growing literature on invasive alien species. The study brings the Ghanaian context of the willingness to pay concept in addressing the Sargassum invasion in Ghana. We also estimate the average number of hours that households are willing to contribute to the management of invasive alien species (Sargassum) in Ghana. Specifically, the study will among other things

- Estimate the average amount of money households are willing to pay for the control of the Sargassum invasion in Ghana.
- Estimate the average number of hours that households are willing to offer for the control of Sargassum.
- Determine other factors that might affect the decision on willingness to pay or contribute labour in the control of the Sargassum invasion in Ghana.
- Identify factors that influence the amount of money and time people are willing to pay for the control of Sargassum invasion in Ghana.

1.3 Research Questions (RQ)

RQ1. How much money is the average household willing to pay in the form of WTP money for the control of the Sargassum invasion in Ghana?

RQ2. What is the total number of time (hours/days) that a household is averagely willing to offer for the control of Sargassum in Ghana?

RQ3.1 What factors influence the willingness to pay decision of a household in the control of Sargassum invasion in Ghana?

RQ3.2 What factors determine the amount of money households are willing to pay for the control of Sargassum invasion in Ghana?

RQ4.1 What factors influence the decision of a household on the number of hours to offer in the control of the Sargassum invasion in Ghana?

RQ4.2 What factors determine the amount of time household are willing to contribute for control of the Sargassum invasion in Ghana?

1.4 Research Hypothesis

The following hypothesis is tested to find some answers to our research questions 3 and 4 above.

H3.1. 1 Ho: WTP-(money) decisions are not influenced by the level of invasion in one's community.

H3.1.2 Ho: WTP-(money) decisions are not associated with the employment status of the household.

H3.2.1Ho: WTP-(money) amount the same for both invaded and uninvaded communities.

H3.2.2 Ho: WTP-(money) amount increases with higher education in Ghana

H4.1.1 Ho: WTP-(time) decision is positively related to households with lower education levels.

H4.2.1 Ho: WTP-(time) is the same for both central and western regions of Ghana.

H4.2.2 Ho: Both males and females commit equal time(hours) to the control of Sargassum in Ghana.

CHAPTER TWO

2.1 BACKGROUND

Invasive alien species (IAS) have detrimental ecological and economic effects that modify ecosystem processes, endanger native species, and harm human activities in diverse ways.

To understand the makeup of invasive alien species (IAS) and how to combat it, we need to understand the factors that drive these species. Public awareness and understanding of invasive alien species lay the foundation for both their management and avoidance (Jubase et al., 2021). Again, public awareness and education create an understanding of how invasive alien species affects the various aspects of biodiversity and human life as well as how native species interact with them (Sosa et al., 2021). The stated findings make it appropriate to discuss what invasive alien species are and how they spread from one geographic region to another.

Invasive species refers to species that are actively displacing native species in an ecosystem, they look like they are contributing to the local ecosystem, but nothing can eat them. Plants, animals, and to a larger extent pathogens have been identified as Invasive Alien Species have undoubtedly been altering the ecosystem and predicting how we live in them.

Trade: bilateral and multilateral trade boost the cumulative and annual rates of invasion due to new sources, receptive regions, trade routes, development of new products, faster ships, and increased air travel. As trade increases and travel time across regions reduces the expected rate of invasion also increases and so does their associated cost and environmental externalities. (Lodge, 2006)

According to Jenkins & Mooney (2006), as the two major forces in the world economy, China and the USA trade with each other and the rest of the world in large quantities of goods they tend to be the largest places with reports on IAS presence. A study by Mooney (2006) states that both countries have similar eco geographic regions and as such have diverse species of flora and fauna which are not native to their regions to combat these IAS, they need to work together to reduce invasion and strengthen regulatory policies.

Some species also tend to invade other regions because of disturbances in the form of global climatic changes and local conditions like the construction of roads. Disturbances can be in the form of anthropogenic and natural causes or changes in the current vegetation cover, all of these can trigger alien species invasion. Considering climatic change, a disturbance that happened about a century ago can facilitate the current movement of species. The movement of the Centaurea solstitialis was not just because of disturbances but also because its native habitat was invaded by pathogens in the soil, which encouraged its invasion of other regions. (Hierro et.al, 2006)

Propagule pressure is identified as one factor aiding species movement to other regions. Propagule pressure is defined as the absolute number of individual species introduced to a new system and the number of introductions events that occur (Lockwood et.al, 2005) Propagule pressure occurs because of globalization, and the varied species reflects the pattern of trade and transport.

Propagule pressure works hand in hand with disturbance. While genetic differences between populations of the same species with potentially different ecological repercussions may appear tiny or insignificant to individuals unfamiliar with biological invasions, the potential consequences are not. As a result, to accomplish meaningful policy and behavioral change, compelling examples and effective communication are required.

IAS may be of any form and diversity, ranging from herbs to vines, trees, shrubs, and aquatic species belonging to diverse families like grasses, legumes, perennial plants, etc.

According to the 2006 report by Convention on Biological Diversity (CBD), invasive species such as the zebra mussels (Dreissena polymorpha) are dominant in North America and Mississippi Basin, water hyacinth which is native to the Amazon basin has invaded tropical habitats worldwide spreading to almost five continents and 50 countries. The ship ratus (Rattus rattus) with its origin in the Indian sub-continent have caused the extinction and catastrophic declines of native birds on a lot of islands worldwide. Avian influenza(H5N1) attacks humans and animals in all parts of the world, temperate and tropics. A study by Noba et al. (2017) reports that 113 invasive species are in West Africa, which are distributed in 94 genera and 43 families. The most dominant families, in descending order in terms of numbers, are Poaceae, Fabaceae, Cyperaceae, Asteraceae, Euphorbiaceae, Solanaceae, and Nymphaeaceae. Notable invasive species in Africa that threaten agricultural productivity, food security, and livelihoods include Siam weed or "Akyeampong" (Chromolaena odorata), algaroba (Prosopis juliflora), water hyacinth (Eichhornia crassipes), Parthenium hysterophorus, Kariba weed or giant Salvinia (Salvinia molesta), sensitive tree/plant (Mimosa spp.), southern cattail (Typha domingensis), Solanum elaeagnifolium, and water lettuce (Pistia stratiotes) (Noba et al. 2017; Gbèhounou n.d.). The water hyacinth (E. crassipes), for instance, is found across Africa, especially in Egypt and East, West, and Southern Africa. The spread, presence, and relevance of invasive species differ from country to country, depending on data availability. In Ghana, there has been an increasing incidence of introducing, establishing, and spreading invasive plants and animal species in the past few decades. Notably among these species are Siam weed (C. odorata), water hyacinth (E. crassipes), Kariba weed (S. molesta), larger grain borer (Prostephanus truncatus), fire ants (Solenopsis maginata), and some whiteflies (Bemisia tabaci).

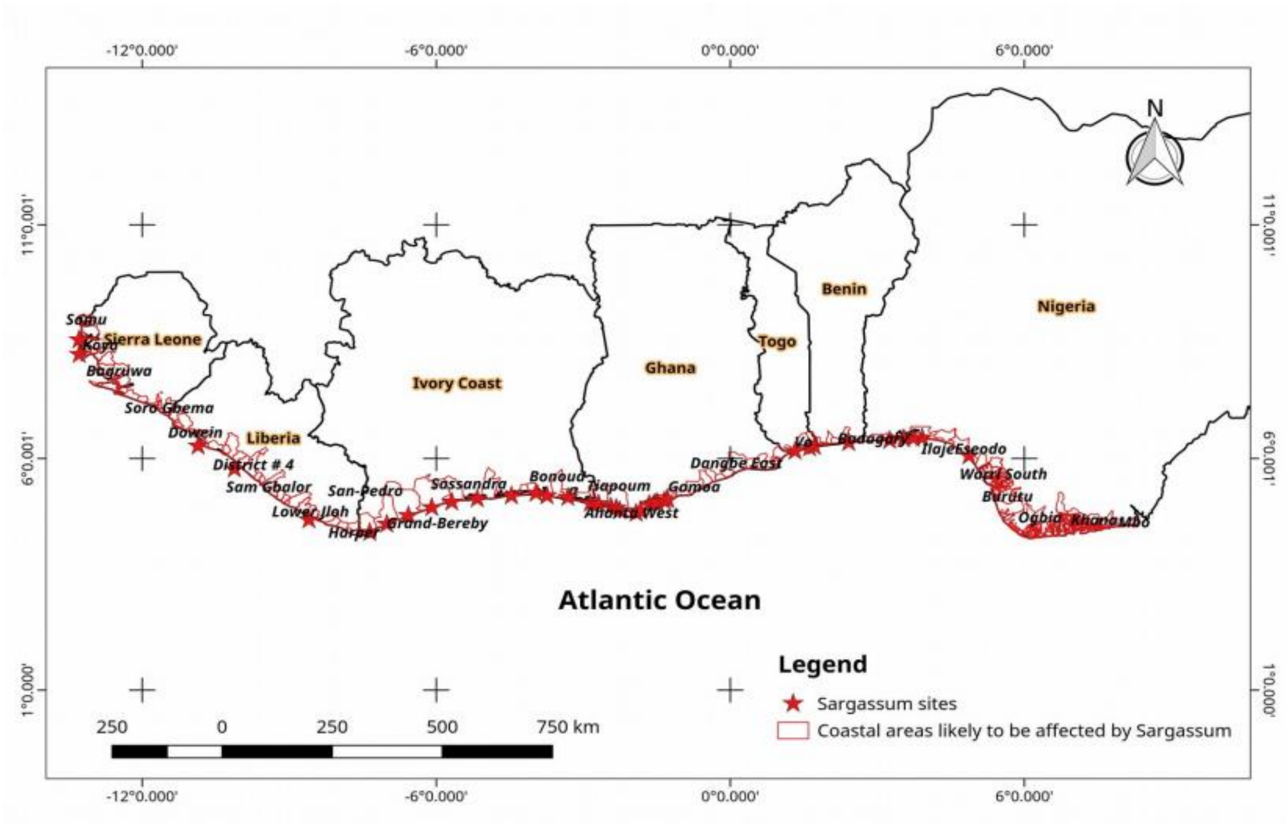

Fig.2.1.1 A map showing the distribution of Sargassum on the West African shoreline.

Fig.2.1.2 A map showing the distribution of Sargassum on the Ghanaian Coast.

The fig 2.1.2 shows that the distribution of Sargassum is more imminent on the west coast of Ghana and conducting a contingency valuation study in these areas will provide a true reflection of realities about Sargassum invasion in Ghana

CHAPTER THREE

3.0 LITERATURE REVIEW

3.1Theoretical framework (valuation of the market and non-market goods)

Ecosystems provide a wide range of goods and services that are essential for human well-being. These services, known as ecosystem services, include both market and non-market goods and services. Valuing ecosystem services is crucial for understanding their economic significance and incorporating their true worth into decision-making processes. In this study, we present a theoretical framework for the valuation of ecosystem services, with a focus on non-market valuation.

Ecosystem services refer to the benefits that humans obtain from ecosystems. They can be divided into two broad categories: market goods and services and non-market goods and services.

1. Market Goods and Services: Market goods and services are those that have a clearly identifiable market and can be bought and sold. Examples include timber, food, water, and other raw materials obtained from ecosystems. These goods and services are typically assigned a market value based on their supply and demand dynamics.

2. Non-Market Goods and Services: Non-market goods and services are those that do not have an established market and are not directly bought or sold. These services are often overlooked in traditional economic analyses but are crucial for ecosystem functioning and human well-being. Non-market services include climate regulation, water purification, pollination, and recreational opportunities provided by ecosystems.

3.1.2 Theoretical Framework for Valuing Ecosystem Services

As Navrud and Pruckner (1997), categorically stated valuation methods play a crucial role in environmental decision-making, serving five primary purposes. These include applying cost-benefit analysis (CBA) to assess the value of projects and new regulations, and evaluating natural resource damage, environmental costing, and environmental accounting. These methods aid in determining the economic impact and appropriateness of exploiting, preserving, or restoring natural resources, providing valuable insights for policy and decision-makers in environmental management.

1. Market-Based Valuation Approaches:

a. Direct Market Valuation: This approach involves estimating the value of ecosystem services based on actual market transactions. For market goods and services, this is straight forward since prices are already established. For example, the value of harvested timber can be determined by its market price.

b. Indirect Market Valuation: In cases where market prices are not available, indirect market valuation methods can be employed. This approach involves using proxy markets or related markets to estimate the value of ecosystem services. For instance, the value of water purification provided by a wetland can be estimated by analyzing the cost of building and operating a water treatment plant.

2. Non-Market Valuation Approaches:

a. Revealed Preference Methods: These methods infer the value of non-market ecosystem services based on observed behavior or choices made by individuals. Revealed preference methods include travel cost analysis, hedonic pricing, and the replacement cost method. These methods estimate the value of ecosystem services by examining how people allocate their time and resources to access or enjoy them.

b. Stated Preference Methods: Stated preference methods involve directly asking individuals about their preferences and willingness to pay for non-market ecosystem services. Contingent valuation and choice experiments are common techniques used in stated preference studies. These methods involve hypothetical scenarios presented to individuals, who then express their willingness to pay for the ecosystem services described.

In a study conducted by Brouwer et.al, (2009) using a contingent valuation to assess willingness to pay to reduce flood risk in Bangladesh about 75% of the population were willing to pay in kind rather than in monetary terms. They found out that the combined use of monetary and non-monetary payment methods will reduce the number of zeros.

c. Benefit Transfer: Benefit transfer involves applying existing valuation studies to similar ecosystems or contexts. This method assumes that the value of ecosystem services in one location can be transferred to another location with similar characteristics. It relies on the idea that the economic value of ecosystem services is transferable across different contexts.

Valuation of ecosystem services(welfare) can be based either on monetary or non-monetary payment modes. In a study by (Vondolia and Navrud, 2019), non-monetary payment is a prevalent strategy employed to collect resources for the management of natural resources. Individuals often offer non-monetary assistance to support environmental causes, as seen in initiatives like South Africa's "working-for-water" program, which requires communities to contribute labour for the removal of invasive species. Similar efforts can also be found in Ghana and Rwanda, where non-monetary resources are harnessed to maintain environmental cleanliness. However, there has been a need to make payments in both monetary and non-monetary methods, (Ahuja and Jutting, 2004; Bla et. al,2006; Oxfam America, 2012, cited in Vondolia and Navrud 2019).

The main foundation of the neoclassical economic theory is that individuals have preferences over both market and non-market goods. Each person can order bundles of a good based on the desirability, leading to a full preference ordering, without regard for the prices. Considering that everyone can order the commodities in bundles based on their preferences. The preference ordering, or more simply put, the individual's preferences, not money, constitutes the most fundamental component of economic theory. Although money plays a key role given its scarcity, it limits how much of a commodity an individual can purchase at a given time.

A utility function over commodities can be used to describe preference ordering. For these purposes, a list or vector of all the levels for the "n" market items the person selects is denoted by the notation X =[x1; x2; ; xn]. The "k" non-market items include Q which is written as Q = [q1, q2..., qk]. Each bundle of goods, X; Q, receives a single integer, U, from the utility function. If and only if XA; QA is favored over XB; QB, the utility function's assigned numbers for any two bundles XA; QA and XB; QB are such that UXA; QA > UXB; QB. Thus, the utility function provides an exhaustive illustration of preferences. (Johnston et al., 2017)

Money enters the process through scarcity, particularly a lack of funds to spend on acquiring the things we enjoy, or a tight budget. For market products, people decide how much of each good to purchase based on preferences, the relative cost of market products P = (p1; p2;...pn,) and available income. Given this starting position, non-market goods are rationed in the sense that no one person may arbitrarily decide the level of these items. How to maximize utility while using income "y" to buy market goods is subject to a rationed amount of non-market goods is the fundamental choice problem.

The amount of non-market products is set, and the total amount spent on market goods cannot exceed income (y - budget restriction). The level of income (y), the prices of every commodity on the market (P), and the quantity of rationed, non-market goods are all factors that affect the X that resolves this issue (Q). There is an ideal demand function, x*=[p,y,Q] for each market good that depends on these three factors. Like the demand function for each market good, the vector of ideal demands can be expressed as X. The indirect utility function is obtained by plugging the set of optimal needs into the utility function. Demand functions, as their name implies, give the number of items demanded at a specific price vector and income level.

3.2 Empirical review (Invasive Alien Species)

A recent study by Ofori & Rouleau (2022) conducted in Elmina; a community on the central coast of Ghana which has just started experiencing the growth of Sargassum contributes to the existing gap in the literature by evaluating the willingness to pay and contribute labour to avoid invasion alien species (Sargassum) in the coastal regions of Ghana by using a contingent choice approach.

The study was more concerned with how socio-economic groups systematically value environmental resources differently. The study found that household income, educational level of the household head, years of residence, distances to the beach, and people’s reaction to Sargassum have a significant impact on their willingness to pay or contribute to an organized clean-up. Among the drivers, they identified that only education and people’s reaction impacted WTP regardless of income levels. They found that only distance had significance for high-income households and income had significance to low-income households. They predicted GH₵59.62 (US$12.42), GH₵26.28 (US$5.48) and GH₵33.43 (US$6.96) as mean monthly WTP for high-income, low-income, and all households, respectively as of the time this study was conducted.

Provencher et al. (2012) conducted a study in the northern United States and Canada where respondents were given the option of paying for a program aimed at improving future results in managing invasive species (Eurasian watermilfoil) in this defined territory. The respondents were owners of shoreline properties near lakes that did not have Eurasian watermilfoil. They concluded from the data that welfare gains were not possible because respondents' preferences were linked to their expectations for the program's future environmental impact.

A lake invasion is estimated to cost $30,550 for one model and $23,614 for another, both of which are reasonable estimates based on a recent hedonic analysis of Eurasian Watermilfoil invasions in the study area (Provencher et.al, 2012) and a companion contingent valuation survey of shoreline property owners on already-invaded lakes.

A study conducted by Adams et.al (2011) titled "Public preferences for controlling upland invasive plants in state parks: Application of a choice model" using a discrete choice experiment on 1436 Florida residents to understand their preferences for state parks. The survey used discrete choice experiment questions, presenting different levels of invasive plants and other park attributes. The results showed that residents would be willing to pay $5.41 per visit to reduce the presence of invasive plants, $3.72 to improve facilities, $3.73 to increase the diversity of native plant species, and $6.71 to increase the diversity of native animal species.

The study also considered the influence of demographic variables and found that they affected the willingness-to-pay for invasive species control, ranging from -$1.13 to +$0.97 per visit. Respondents who had acted against invasive species or had more knowledge about them showed a positive influence on willingness-to-pay (+$2.47 and +$0.83, respectively).

Interestingly, respondents who perceived invasive species as beneficial, due to their aesthetic appeal, were willing to pay an extra $0.80 per visit to a park with increased coverage of these plants.

Using data from 115 Florida state parks, the researchers calculated that park users would be willing to spend $89.4 million annually to manage invasive plants in upland parks. However, the current funding for that purpose stood at $32 million annually and fell short, indicating a need for additional management efforts. The finding provided a basis for evaluating control programs for invasive species in state parks.

The article by Zhang et.al, (2016) explores the capabilities of satellite-based sensors in detecting and monitoring the distribution and abundance of Sargassum in the study region. They utilized data collected over a specific period to analyze Sargassum dynamics and its relationship with environmental factors.

By applying various algorithms and processing techniques to the remote sensing data, the researchers detected and tracked Sargassum patches. The study provided insights into the spatial and temporal variations of Sargassum blooms and highlights the potential of using remote sensing technologies for Sargassum monitoring.

The results of the study demonstrated the usefulness of MODIS and VIIRS sensors in providing valuable information about Sargassum distribution patterns and their changes over time. The findings contributed to a better understanding of the dynamics and behavior of Sargassum in the Caribbean Sea.

According to Putman et.al, (2018) by analyzing satellite observations, the researchers identified and mapped the distribution of Sargassum in the study area during the specified time. They also explored the variability of Sargassum blooms/ growth and examined the environmental factors that might have influenced their occurrences. The study provides insights into the dynamics of Sargassum in the Caribbean Sea, shedding light on its seasonal variations and potential connections to oceanographic processes. The findings contribute to a better understanding of the factors that drive Sargassum distribution and can aid in the development of monitoring and management strategies.

The article by Putman et.al, (2018) examined the various factors and processes that contribute to the dispersal and connectivity of Sargassum populations. They focused on understanding how ocean circulation patterns and larval transport influence the distribution and connectivity of Sargassum across different regions.

Using a combination of field observations, genetic analyses, and modeling approaches, the authors explored the potential pathways and mechanisms that facilitate the dispersal and colonization of Sargassum. They investigated the role of ocean currents, such as the North Equatorial Current and the Gulf Stream, in transporting Sargassum propagules over long distances.

The study revealed that oceanic circulation plays a crucial role in shaping the distribution and connectivity of Sargassum populations. It highlighted the importance of both large-scale oceanographic processes and local hydrodynamics in facilitating the dispersal and establishment of Sargassum in different areas of the tropical Atlantic Ocean.

Furthermore, the researchers emphasized the significance of genetic connectivity among Sargassum populations, indicating potential long-distance dispersal events and gene flow between distant regions. The findings of this study contribute to our understanding of the mechanisms that drive the distribution and connectivity of Sargassum populations in the tropical Atlantic Ocean. This knowledge is crucial for predicting and managing the spread of Sargassum and can aid in the development of conservation and mitigation strategies.

The article by Smetacek and Zingone (2013) focused on the phenomenon of macroalgal blooms, including green and golden seaweeds, and their increasing occurrence worldwide. The authors aimed to provide an overview of the ecological implications and potential causes of these seaweed blooms. They discussed how these blooms, often referred to as seaweed tides, have become more frequent and extensive in various coastal areas across the globe. Through a synthesis of existing research and observations, the authors highlighted the impacts of these seaweed blooms on coastal ecosystems and human activities. They discussed how excessive growth and accumulation of seaweed can lead to oxygen depletion, alter nutrient cycling, and affect the abundance and distribution of marine organisms.

Smetacek and Zingone (2013) explored several factors that contribute to the rise of seaweed blooms. They discussed the potential role of nutrient enrichment from human activities, such as agricultural runoff and wastewater discharge, as well as the influence of changing environmental conditions, including warming temperatures, and altered hydrodynamics. The study emphasized the need for further research to understand the complex interactions and feedback mechanisms driving the increase in seaweed blooms. It also highlighted the importance of developing strategies for monitoring, predicting, and mitigating the ecological and socio-economic impacts of these events. Overall, the article provided valuable insights into the global phenomenon of green and golden seaweed tides and raised awareness about the need for better understanding and management of these blooms.

These findings suggest that WTP for managing invasive seaweed varies depending on several socioeconomic and attitudinal factors, which should be considered in designing effective management strategies.

3.3 Control and management of invasive alien species

Non-indigenous organisms frequently reproduce quickly. Managers can anticipate potential threats posed by certain species and take timely action to prevent their establishment by conducting thorough investigations and surveillance. Gaining knowledge of a species' position on the invasive spectrum aids in effectively addressing and mitigating the harm it may already be causing or may pose in the future**.**

The Invasion curve depicts the feasibility of eradicating an invasive plant, insect, or animal starting at the time the invasive species is introduced. Over time, the feasibility of eradication decreases until it is no longer possible. Below is a diagram of the Invasion Curve.

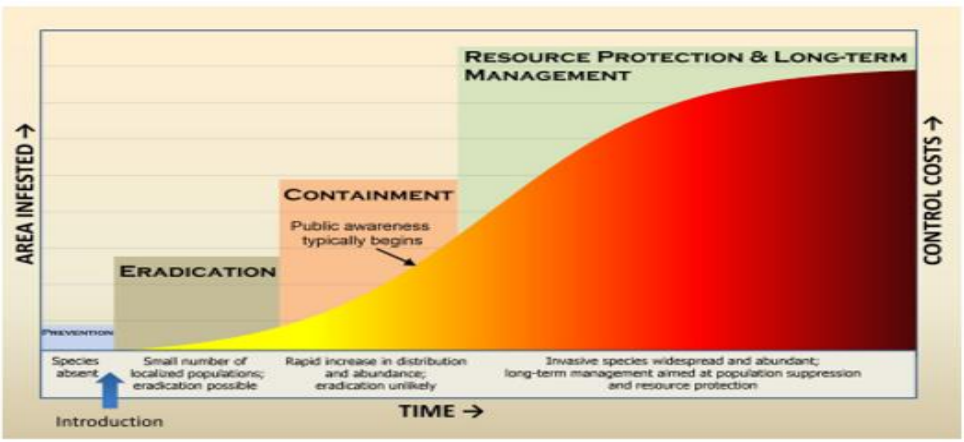

Fig.3.2 The invasion curve. Adapted from Invasive Plants and Animals Policy Framework. State of Victoria, Department of Primary Industries, 2010.

In a study conducted by Harvey and Mazzotti (2014), the invasion curve is in four stages which shows how the management of invasion can be done.

1. Prevention: The most economically efficient approach to handling invasive alien species (IAS) is prevention. Establishing barriers to restrict the entry of non-indigenous species serves as the primary and most effective strategy for managing their presence and the associated losses.

2. Eradication: Eradication becomes feasible when early detection of IAS occurs promptly after their introduction. Swift responses play a crucial role in minimizing the impact of

IAS. Although eradication is less cost-effective compared to prevention, it represents a step in the right direction for IAS management.

3. Containment: If both prevention and eradication measures have failed, and IAS have already entered the borders of a country or town, with their population rapidly growing, the focus shifts from prevention and eradication to containing the species and preventing further spread. Containment is a highly costly phase of management.

4. Resource Protection and Long-Term Management: When an invasive species has become too widespread and abundant to be controlled in all areas, eradication becomes unattainable. Long-term management aims to minimize the impact of IAS and keep their populations at the lowest feasible levels, with a focus on protecting specific, highly valued resources. The support of the community becomes crucial in ensuring the success of long-term management programs.

For the Invasion of Sargassum in Ghana, we look at being in the last stage which is the “Resource Protection and Long-Term Management” phase.

This study will help find the best viable way to manage Sargassum and its eco-environmental impacts on indigenes whose livelihood is dependent on the ecosystem under the attack of the Sargassum invasion

CHAPTER FOUR

4.0 Introduction

This chapter describes the methods and processes used in conducting the study. The contingent valuation method (CVM) is used to study the willingness to pay money or contribute labour to control the spread of Sargassum in Ghana. The study's data gathering methods, sample selection criteria, and data analysis strategies are described in detail in this chapter. This chapter maintains the validity of the study and makes it possible for subsequent researchers to replicate the research process by providing a thorough overview of the technique.

Environmental goods are non-market goods since they are not traded in the market. These goods, however, provide numerous benefits to humans. Neglecting such benefits will mean that society can be made worse off through a lack of policy for the optimization of such nonmarket value of goods. Economists have been evaluating this environmental benefit using the stated preference approaches. Louviere et al. (2010) opines that an individual's preferences for "alternatives" (whether products, services, or courses of action) expressed in a survey context are elicited using stated preference approaches This is a survey base method and involves specific method like the contingent valuation and discrete choice experiment.

4.1 Research Design

The research design for this study is quantitative in nature and utilizes a cross-sectional survey design. This design allows for the collection of primary data through a structured questionnaire, enabling the exploration of individuals' willingness to pay (WTP) or contribute labour to address the Sargassum invasion problem in Ghana. The contingent valuation method (CVM) is employed as the primary technique for eliciting individuals' preferences and estimating their willingness to pay. The method allows for measuring the willingness to pay for non-market goods which is a means to evaluate environmental goods.

4.2 Data Collection

Questionnaire Development. A structured questionnaire was developed based on relevant literature reviews, expert consultations, and pilot testing. The questionnaire had different sections that capture respondents' socio-demographic information, knowledge, and awareness of the Sargassum invasion, the effect the of Sargassum invasion on various economic activities, their willingness to pay or contribute labour, and factors influencing their decisions.

A pilot test of the questionnaire was administered before the full survey was conducted. This offered the researchers the opportunity to test from the pilot samples the accuracy of various alternatives presented in eliciting the responses that answer specific research questions and hypotheses through a fair and persuasive informational presentation, the main objective of pretesting was to create decision scenarios and a questionnaire that is clear and trustworthy to respondents. According to Carson (2012), Pretesting is essential to content validity since it ensures a survey instrument's quality. Both qualitative and quantitative pretests were conducted. The qualitative pretest was done to evaluate the understanding of respondents on the content of the questionnaire. Quantitative pretesting was also done to check the strength of the questionnaire for statistical analysis. Both tests were done using a small focus group in the sample population.

4.3 Sampling Technique

A multi-stage sampling technique was employed to select the study participants. In the first stage, a purposive sampling method was used to select the study area in Ghana, considering the regions most affected by the Sargassum invasion. In the second stage, a stratified sampling technique was adopted for the study where towns/communities were stratified to ensure that the towns with a large amount of Sargassum presence were considered for the study. Finally, a random sampling method was used to select households within the chosen communities for the study.

4.4 Data Collection Procedure

Data collection was conducted through face-to-face interviews with selected respondents using the structured questionnaire. The main researchers together with trained enumerators were responsible for administering the interviews and collecting the data. Prior informed consent was obtained from each respondent before their participation, ensuring ethical considerations were followed throughout the data collection process. Again, to ensure the safety and security of both researchers and enumerators, permission was sought from the leaders in each town or community before the questionnaires were administered in their community.

4.5 Data Analysis

The collected data was coded, entered to MS Excel, and later transferred into Stata. The data was then cleaned to ensure accuracy and completeness. Descriptive statistics for both continuous and categorical variables, such as frequencies, percentages, means, and standard deviations, were calculated to summarize the socio-demographic characteristics of the respondents, their knowledge levels, and willingness to pay or contribute labour. Statistical techniques, such as logistic regression analysis, were estimated to examine the factors influencing individuals' willingness to pay or contribute labour, considering socio-demographic variables and other relevant factors.

4.6 Estimation Procedure

i. Logistic regression

A logistic regression (logit) model as described by Wooldridge (2010) is employed when we have a binary response outcome variable. In this case, our dependent variable would be whether a respondent is willing to pay or not. It takes two values, 0 and 1.

$$WTP = \{0\ if\ no\ 1\ if\ yes\} \quad (1)$$

This model estimates the probability that y=1 as a function of the explanatory variables.

$$P = Pr[y=1|x] = F(X\beta) \quad (2)$$

Where X and β are a vector of independent variables and the associated variable coefficients respectively. F($X\beta$) is the cumulative distribution function (cdf) of the logistic distribution which is assumed to be between zero and one.

$$F(\Lambda(X\beta) = \frac{e^{X\beta}}{(1+e^{X\beta})} \quad (3)$$

It is only the sign of the coefficients which can be interpreted in a logit model setting.
If x_j is a continuous variable, we can find the magnitude of the effect as follows:

$$\frac{\partial p(x)}{\partial xj} = f(X\beta)\beta j \quad (4)$$

$$where,\ f(z) \equiv \frac{dF}{dz}(z) = \frac{\exp(Z)}{[1+\exp(Z)]} \quad (5)$$

$$\frac{\partial p(x)}{\partial xj} = \frac{\exp(X\beta)}{[1+\exp(X\beta)]2}\ \beta j \quad (6)$$

On the other hand, if x_j is a dummy variable then the partial effect from changing xj from zero to one would be:

$$F(\beta 1+\beta 2x2+\cdots+\beta j-1xj-1+\beta j) - F(\beta 1+\beta 2x2+\cdots+\beta j-1xj-1) \quad (7)$$

Similarly, if xj is a categorical or discrete variables we can estimate the following expression to find the effect on the probability when xj is increasing from c_j to c_{j+1}

$F(\beta 1+\beta 2x2+\cdots+\beta j-1xj-1+\beta j(cj+1)) - F(\beta 1+\beta 2x2+\cdots+\beta j-1xj-1+\beta jcj)$ (8)

POS__WTP_MONEY=$\beta 0$+$\beta 1$gender+$\beta 2$education+$\beta 3$emp_status_bo+$\beta 4$Eco-Activity+$\beta 5$ HHMinors+$\beta 6$ YRS OF RESIDENCE+$\beta 7$INCOME+e (9)

POS__WTP_TIME=$\beta 0$+$\beta 1$gender+$\beta 2$education+$\beta 3$emp_status_bo+$\beta 4$Eco-Activity+$\beta 5$ HHMinors+$\beta 6$ YRS OF RESIDENCE+$\beta 7$INCOME+e (10)

ii. Ordinary Least Square (OLS)

We continue with the traditional estimation method (ordinary least square). Consider the following population model adopted from Wooldridge (2009) and used by Albinet. (2018)

$$WTP=X\beta+u \tag{11}$$

For OLS to be consistent the error term necessarily should have a mean zero and should be uncorrelated with the independent variables. A sufficient condition is that the error term conditional on the explanatory variables has a zero mean.

$$E(u)=0 \tag{12}$$

$$cov\ (u, x_j) = 0 \text{ } \textit{Where, j=1, 2…k} \tag{13}$$

$$E(u|x_1x_2\ldots,x_j)=0 \tag{14}$$

Under assumption (12) and (13), we have the population regression function:

$$E(\text{MID\_}WTP|x_1x_2,\ldots,x_j)=\beta 0+\beta 1x1+\beta 2x2+\cdots+\beta jxj \tag{15}$$

According to Wooldridge (2010), the zero mean assumption is valid as long as an intercept is present, but there is a problem to be addressed about the error term's zero covariance with the explanatory factors. No self-selection or decision variables are used as regressors in the models (9) and (10), preventing any potential association between the explanatory variables and the variables that were excluded (if any). As a result, we can state that the models are consistent with the zero covariance assumptions since there is no bias in the missing variable, measurement mistake, or simultaneity issue.

4.7 Limitations

Several limitations should be acknowledged in this research. Firstly, the contingent valuation method relies on stated preferences rather than revealed preferences, however which could introduce bias in estimating willingness to pay. Additionally, the study's findings may be influenced by social desirability bias, whereby respondents may provide socially desirable responses rather than their true preferences. Again, for some communities in the central region, the expected sample size may not have been achieved due to safety and security of researchers. Finally, the generalizability of the findings may be limited due to the specific context of the study in Ghana.

Carson and Mitchell (1995) critiqued the CV method as respondents of a CV survey will be inherently unresponsive to the characteristics of the good being valued, meaning respondents will not be willing to pay more for more of a particular good. However, Carson (1995) suggested that this limitation can be avoided with the appropriate survey design, pretesting, and administration.

However, several studies have been conducted using this method and have yielded good results for policymaking. Following the contemporary suggestion for conducting stated preference by Johnson et.al., (2017), we were able to overcome most of these challenges to conduct a contingency valuation study that yields valid results just like past studies.

4.8 Conclusion

This chapter presented the research methodology employed to investigate the willingness to pay or contribute labour in controlling Sargassum invasion in Ghana using the contingent valuation method. The research design, data collection procedures, sampling technique, and data analysis techniques were outlined, ensuring transparency and replicability of the research process. The next chapter will present the results and findings of the study, followed by a discussion and interpretation of the findings.

CHAPTER FIVE

DATA ANALYSIS AND RESULTS

5.1 Description of the study areas

We conducted a contingent valuation (CV) survey in the western and Central regions of Ghana, specifically in areas that have been affected by Sargassum invasion.

The wide invasion of Sargassum on the central and western-most parts of Ghana's shore do have a wide impact on the small and medium scale artisanal fisherfolks, and tourist site operators, as well as beachgoers and residents who have their dwelling along the coast. Most likely, fishermen are faced with frequent masses of Sargassum floating, and destroying their nets, which leads them to spending lots of productive hours fixing the nets. As floating Sargassum continues to disrupt fishing operations, fish processors who rely on affordable supply of fish from the sea have complained about the high cost and inconsistent supply of fish. Tourist operators complained about a decrease in tourists visits due to seaweed invasion, this has brought about economic and environmental downturns.

5.1.1 Western Region- Jomoro District

The Jomoro District is in the Western Region of Ghana, along the country's southern coast. It is situated between latitudes 4° 48'N and 5° 18'N, and longitudes 2° 08'W and 2° 40'W. The district is named after the Jomoro River, which flows through the area. The Jomoro District is known for its picturesque coastline, which stretches along the Gulf of Guinea. The coastal communities in Jomoro District are characterized by their natural beauty, vibrant culture, and reliance on fishing and agriculture for livelihoods. One of the prominent coastal communities in Jomoro District is Half Assini, which serves as the district capital. It is a bustling town with a lively fishing industry. The community is also known for its historic sites, such as Fort Apollonia, a colonial-era fort built by the British.

Nzema East is another community along the Jomoro District coastline. It is known for its beautiful sandy beaches, attracting tourists and locals alike. The area is also home to the Nzulezo Stilt Village, a unique settlement built on stilts above the Amansuri Wetland. Other notable coastal communities in the Jomoro District include Tikobo No. 1, Bonyere, Busua, and Cape Three Points.

These communities offer serene beaches, palm-fringed shores, and opportunities for water sports and relaxation.

Overall, the communities along the coast of the Jomoro District possess a distinct charm, blending natural beauty, cultural heritage, and economic activities centered around fishing and agriculture. The area attracts visitors seeking to explore Ghana's coastal treasures and experience the warmth and hospitality of the local communities.

5.1.2 Central Region

I. Cape Coast Metropolis

Cape Coast Metropolitan is a coastal city located in the Central Region of Ghana, West Africa. Nestled along the Gulf of Guinea, it is renowned for its rich history, beautiful beaches, and vibrant fishing industry.

The city's geography is characterized by its proximity to the Atlantic Ocean, which shapes the livelihoods and economic activities of the local communities. Fishing plays a vital role in the lives of the residents, with many families depending on it as their primary source of income.

Cape Coast boasts a natural harbor that provides a favorable environment for fishing activities. The traditional fishing methods employed here include canoe fishing, where local fishers venture out to sea in their handmade canoes, equipped with nets, lines, and hooks. These fishers display great skill and knowledge in navigating treacherous waters and finding the best fishing spots.

The waters off Cape Coast are abundant with a diverse range of fish species, including anchovies, sardines, mackerel, tuna, and snapper. The fishers utilize various techniques such as net casting, longlining, and handline fishing to catch these marine treasures. They often set out early in the morning or late in the afternoon, returning with their catches to the bustling fish markets along the coast.

The fishing industry in Cape Coast is not limited to just catching fish. It also encompasses ancillary activities such as fish processing, preservation, and marketing. Once the fish are brought ashore, they are sorted, cleaned, and prepared for sale. Some are smoked, dried, or salted for preservation, while others are sold fresh to local markets, restaurants, and even exported to neighboring countries.

The fishing sector in Cape Coast Metropolitan provides employment opportunities for a huge portion of the population. It supports not only the fishers but also a network of individuals engaged in fish processing, transportation, and marketing. Fishmongers, fish processors, boat builders, and net makers all contribute to the local economy, making fishing a vital economic activity for the region.

The fishing industry also has social and cultural significance in Cape Coast. It forms an integral part of the local traditions and rituals, with fishing festivals celebrated to honor the sea gods and seek their blessings for bountiful catches. These festivals are marked by colorful processions, music, dance, and feasting, bringing together the community in a display of unity and gratitude.

However, the fishing industry in Cape Coast faces challenges such as overfishing, declining fish stocks, and environmental degradation. Climate change, pollution, and unsustainable fishing practices threaten the future sustainability of the sector. Efforts are being made by the government, non-governmental organizations, and local communities to promote sustainable fishing practices, conservation of marine ecosystems, and the empowerment of fishing communities.

In conclusion, Cape Coast Metropolitan is a vibrant coastal city in Ghana with a thriving fishing industry. The geographical location along the Gulf of Guinea provides a favorable environment for fishing activities, making it a significant economic activity in the region. The sector not only provides livelihoods but also plays a crucial role in the social and cultural fabric of the community. However, sustainability and conservation efforts are necessary to ensure the long-term viability of the fishing industry in Cape Coast.

II.Elmina

Elmina is a historic coastal community in Ghana's Central Region, West Africa. It is about ten kilometers west of Cape Coast, the regional capital. Elmina is known for its rich cultural heritage, beautiful beaches, and historical significance as the site of one of Sub-Saharan Africa's oldest European settlements. Elmina is situated along the Gulf of Guinea, overlooking the Atlantic Ocean. The community is distinguished by its tropical climate, which features warm temperatures and high humidity all year. The region has a distinct wet and dry season, with the wet season typically lasting from April to October. Elmina is built on hilly terrain, with some parts of the community located on elevated areas with views of the coast. Palm trees and other tropical vegetation dominate the landscape. Elmina's sandy beaches are well-known for their beauty, attracting both locals and tourists.

Elmina has a mix of traditional and modern architecture. The town is distinguished by its vibrant colors, with many buildings painted in bright hues that reflect the community's lively spirit. Local shops, markets, and eateries line the streets, allowing visitors to immerse themselves in local culture and sample traditional Ghanaian cuisine. Elmina's economy is heavily reliant on fishing, and the community's fishing harbor is a hive of activity. There are fishing boats in the water, and the local market is stocked with freshly caught fIish.

II. Moree

Moree is a small-scale fishing and coastal community located in the Central Region of Ghana (Marquette et.al., 2002). It is a vibrant community known for its fishing industry, where fishers use various fishing methods to catch a variety of fish species. Women in Moree also play a significant role in fish processing, distribution, and marketing. The community is home to several fish processing factories, which have created job opportunities for residents (Marquette et.al., 2002).

Marquette et.al. (2002), further iterated that apart from fishing, agriculture is also an important economic activity in Moree. The community is surrounded by fertile land used to cultivate crops. However, the fishing industry is the predominant economic activity, and the community relies heavily on it for income. Economic losses in Ghana's fisheries have direct impact on fishing communities because the income generated from fishing is not enough to cover the costs (Ghana Fisheries and Aquaculture,2016).

The Ghana Fisheries and Aquaculture Development Plan aims to improve the country's fisheries, which generate around US$1 billion (about $3 per person in the US) per year and support 135,000 fishers. The plan has seven targets for the next five years, including maintaining current production levels, increasing revenue, increasing aquaculture production, and improving fisheries management (Ghana Fisheries and Aquaculture,2016). The plan aims to make Ghana's fisheries more economically viable and ensure they contribute to the country's GDP. However, there is a lack of investment in management and value addition, which has resulted in poor profitability for fishing communities (Ghana Fisheries and Aquaculture,2016).

Moree is also home to several tourist attractions, including the Cape Coast Castle, which is a UNESCO World Heritage Site (Marquette et.al., 2002). The castle is a popular destination for tourists interested in learning about Ghana's history and culture. There are also several beaches in Moree that offer recreational activities such as swimming and sunbathing.

Despite the tourism industry in Moree, the community still faces several challenges. One of the most significant challenges is overfishing, which has led to a decline in fish stocks (Finegold.et al, 2010). This decline has made it difficult for fishers to earn a living, resulting in poverty in the fishing communities. The government has implemented several measures to combat overfishing, including the establishment of closed fishing seasons and protected areas (Finegold.C.et al 2010).

In conclusion, Moree is a small-scale fishing and coastal community that relies heavily on the fishing industry for income. Women also play a significant role in fish processing and marketing. Apart from fishing, agriculture is also an important economic activity in Moree. The community is home to several fish processing factories, which have created job opportunities for residents. The Ghana Fisheries and Aquaculture Development Plan aims to improve the country's fisheries, which generate around US$1 billion (about $3 per person in the US) per year and support 135,000 fishers. The plan has seven targets for the next five years, including maintaining current production levels, increasing revenue, increasing aquaculture production, and improving fisheries management. Moree is also home to several tourist attractions, including the Cape Coast Castle, which is a UNESCO World Heritage Site. However, overfishing remains a significant challenge in the community, resulting in poverty in fishing communities.

5.2 Data Interpretation

The findings from the analysis of the data collected for the thesis topic “Willingness to pay or contribute labour to control Marine Invasive Species (Sargassum): A case study in Ghana” is presented in this chapter. A face-to-face interview was conducted with 528 individuals (observation). These observations were selected randomly from eight different communities within the western and central regions of Ghana. Five of these communities were randomly drawn from the western regions and included Half-Assini, Metica, Jay way, Effasu and Bonyere. The other three communities from the central region were Elmina, Cape coast and Moree. 397 observations were taken in the western region while the remaining were drawn from the central region. The disparity was primarily because the western region was the most Sargassum invaded coast and was the primary focus to ascertain the welfare impact on the affected community. The central region, though not invaded yet, was added to the study as a reference group to obtain how willingness to pay or contribute labour may differ for the affected and unaffected communities in Ghana.

The analysis is done to address the objectives of the study which include:

- Estimate the average amount of money households are willing to pay for the control of the Sargassum invasion in Ghana.
- Estimate the average number of hours that households are willing to offer for the control of Sargassum.
- Determine other factors that might affect the decision on willingness to pay or contribute labour in the control of the Sargassum invasion in Ghana.

5.2.1 Description of Variables.

A brief description is given about the variables used in the study and how we measured them in this study. For those continuous variables, we provide the means and expected sign or direction of effect on the dependent variable where applicable.

Table 5.2.1. Description of Variables used in the study.

Variable	**description**	**Unit of measurement**	**Mean value**	**Expected sign (+ or -) Wtp dummy Wtcl dummy**
AGE (Q31)	The age of the respondent used for the study	Years as given by the respondent	38.55	+/- for both WTP-money and labour scenario
HHSIZE (Q4)	Household size of the respondent	All household members	5.56	(-) WTP-money (+) WTP- time

		including the respondent		
HHMINORS (Q5)	Household size-minors, the number of minors in the household	Household members less than 18 years of age	2.36	(-) WTP-money (+) WTP-time
YRS OF RESIDENCE (*Q1*)	The number of years that a respondent has stayed in the community of study as the period of interview	A minimum of one year is required to take part in the survey	20.78	Either (+/-) for both scenarios
TOTAL SPOUSE (36)	The number of spouses for married respondents	This is the response from only married respondents	1.27	(-) WTP- money (+/-) WTP-time
EXPENDITURE (Q38)	Monthly expenditure for the household	Average household expenditure for the previous month as given by the respondent. This is also used a proxy for income of	554.31	(+) WTP-money for higher expenditure (income) household because they would have high opportunity cost of time and that will mean they will prefer payment in money to time

		the respondent.		(-) WTP-time for household with high expenditure(income)
SAVINGS (Q39)	Monthly savings for the household	Average household savings for the previous month as stated by the respondent.	187.33	(+) WTP- money. Thus if higher savings is associated with the rich household, then they will equally prefer to pay from their savings and use their time for making more income/savings (-) WTP- time
WTP_MONEY (Q16)	Willingness to pay the amount as stated by household	This is measured in Ghana cedis (Ghc). Optional amounts are provided where a respondent is allow to select and respondent has also an option to state their own amount where	50.47	

		they want to pay above Gh¢ 60		
WTP_MID_MONEY	The median amount that a household is willingness to pay for the control of Sargassum invasion in their community.	Measured in Ghana Cedis (Gh¢). This is calculated by finding the midpoint of the choice intervals provided. The median is then coded against the choice amount and used for further analysis.	52.138	
WTP_TIME (Q20)	Number of labour-hours a household is willing to offer for the control of Sargassum in their community	This is measured in hours per unit of household per year. Choices are provided for the respondent to select and where their choice is	38.83	

		above 60 hrs per annum, they are allowed to state the number of hrs		
MID_WTP_TIME	The median number of labour- hours that a household is willing to contribute for the management of Sargassum invasion in their community	Measured in hours per household per year. The midpoint of provided options and respondent's choice is considered midpoint of the given interval	38.658	
HHH (Q37)	Household head	This is binary where 1 and 0 is assigned to male and female-headed household respectively		Either (+/-) for both scenarios
ECO_ACTIVITY (Q3)	Household's main economic activity	A list of economic activities is provided and		Either (+/-) for both scenarios

	(Base: unemployed)	where the activity is not available in the options, they can state.		
TOTAL EFFECT (Q14)	Assumed total effect of Sargassum invasion on community. Either positive/negative	General perceived effect of Sargassum on the community. Either positive or negative. 0 and 1 for negative and positive effect respectively. Not relevant responses are dropped during analysis		Either (+/-) for both scenarios. If found to be negative effect, then a (+) relation is expected for both scenarios and if the effect is positive, then a (-) relation is expected
EFFECT-FISHING (Q13i)	Effect of Sargassum on fishing-related activities	Negative or positive (0, 1)		Either (+/-) for both scenarios. If found to be negative effect, then a (+) relation is expected for both scenarios and if the effect is positive,

				then a (-) relation is expected
EFFECT-RECREATION	Effect of Sargassum invasion on recreation in the community	Negative or positive (0, 1)		Either (+/-) for both scenarios. If found to be negative effect, then a (+) relation is expected for both scenarios and if the effect is positive, then a (-) relation is expected
EFFECT- TOURISM	Effect of sargassion invasion on tourism in the community	Negative or positive (0, 1)		Either (+/-) for both scenarios. If found to be negative effect, then a (+) relation is expected for both scenarios and if the effect is positive, then a (-) relation is expected
EFFECT- WATER QUALITY	Effect of Sargassum invasion on water quality	Negative or positive (0, 1)		Either (+/-) for both scenarios. If found to be negative effect, then a (+) relation is expected for both scenarios and if the effect is positive,

				then a (-) relation is expected
EFFECT- ENVT-QUALITY.	Effect of Sargassum invasion on the environment	Negative or positive (0, 1)		Either (+/-) for both scenarios. If found to be negative effect, then a (+) relation is expected for both scenarios and if the effect is positive, then a (-) relation is expected
POSITIVE-WTP-MONEY	Dummy variable for positive willingness to pay money to control Sargassum invasion	Dummy variable where positive willingness to pay is 1 and non- protest zeros are reported as 0		
POSITIVE _WTP- TIME	Dummy for positive willingness to contribute labour in controlling Sargassum invasion	Dummy variable where positive willingness to contribute labour is 1 and non-protest zeros are reported as 0		-

EMPLOYMENT STATUS (Q34)	Employment status of the respondent (base: unemployed)	Either the respondent is fulltime, parttime, student, apprentice or retired. The unemployed is used as the base category		(+/-) for both WTP-money and labour scenarios depending on the employment situation for the respondent.
EDUCATION LEVEL (Q33)	Level of education of the respondent (base category: no education)	Respondents are allowed to choose either they have had non, junior high, senior high, or tertiary education the uneducated is used as the base category		Either (+/-) for both scenarios
M-STATUS (Q35)	Marital status of the respondent	Options are provided for the respondent to choose their current marital status		
EFFECTIVENESS_WTP-MONEY (Q23a)	How realistic is the WTP-money	Dummy variables		(+/-) for both scenarios depending

	scenario to the respondent?	where "very realistic and somewhat realistic are merged" and "unrealistic less realistic are merged" take the value of 1 and 0 respectively. Do not know responses are ignored from analysis		on the dominating choice by respondents. We expect household that see the policy to be realistic to state lower amount since they are going to pay the amount stated when the program is implemented . large figures will be given when respondents see the program as unrealistic because they will not have to pay because its never going to be implemented.
EFFECTIVENESS _LABOUR	How realistic is the labour scenario to the respondent	Dummy variables where "very realistic and somewhat realistic are merged" and "unrealistic less realistic are merged " take the value of 1 and 0		(+/-) for both scenarios depending on the dominating choice by respondents. We expect that holding other factors constant, household who see the policy as realistic will contribute more time

		respectively. Do not know responses are ignored from analysis		for its implementation
ENUMERATOR	Names of personnel used for data collection	Dummy variable with 1 and 0 for the “main researchers” and 0 for “assisted personnels”		No significant effect expected
LINC	The log of income of households.	Income is obtained by summing savings and expenditure		(+) WTP- money (-) WTP- time
WESTERN REGION	The main study region	Western region has the has more Sargassum invaded communities . the central region has less sargassum and it is use as a reference region. Both		(+)WTPmoney (-) WTP- time

		regions have communities located along the coast		

5.2.2 Summary statistics

The table below shows the summary statistics of some continues variables used for the study.

Table 5.2.2. Summary statistics for continuous variables

Variable	Obs	Mean	Std. Dev.	Min	Max
AGE	519	38.551	12.491	18	84
EXPENDITURE	483	554.313	436.689	50	2500
SAVINGS	338	187.331	175.166	10	1000
YEARS OF RESIDENCE	528	19.902	15.793	1	80
YRS SARG VISIBILITY	522	6.83	3.1	1	20
HHMINORS	528	2.364	1.851	0	8
INCOME	338	781.749	556.078	120	2950
WTP MID MONEY	340	52.138	48.511	5.5	360
WTP MONEY	440	39	48.2	0	360
WTP TIME	509	30.692	23.526	0	96
MID WTP TIME	424	38.658	20.33	5.5	96
TOTAL SPOUSE	372	1.266	.51	1	4
HHSIZE	528	5.557	2.845	1	15

An average age of 38 years was reported for the respondents in the study, the minimum age is 18 and this is because the study was meant to include only adults in the selected community. 519

observations were recorded for the age variable because 9 of the respondents did not want to give any information about their age and these were reported as missing values for the age variable.

The respondents had an average of 19 years of stay in their respective communities with a minimum of 1 year stay period. We conducted a study on respondents who have stayed in the selected community for at least one year. We felt these were in a better position to provide answers to the questions especially since it bothered on how Sargassum has impacted on livelihood for the past period. Another revelation we found was that monthly expenditure was averagely higher than monthly savings for the selected respondents and their community. An average of Gh.554 and Gh.187 were reported for monthly expenditure and savings. This is like early studies in the fishing communities in Ghana (Ofori & Rouleau, 2021) which reported the low-income levels among persons in the fishing communities. A reason for the high average expenditure could be the absence of credit purchasing facilities for the fish farmers and that every transaction must be paid upfront. This also accounts for the recorded low monthly savings because high spending from a lower-income individual will also mean lower savings for such a household. An average of Gh cedis 52 and 38 hours were recorded for the amount and hours that households are willing to pay and contribute respectively for the control of the Sargassum invasion in Ghana.

Just as Ofori & Rouleau (2021), found that the people in Elmina were willing to pay GH 33 monthly to help control Sargassum. The results also mean that respondents were willing to offer 5 working days (7.5hrs daily) annually to help control the Sargassum invasion in Ghana. Given that Sargassum invasion in random and mostly last for some months, this period is enough to help in the control of sargassum invasion in Ghana

5.2.3 Summary on key Categorical Variables

528 respondents were used for the study. 373 of these representing 70.64% of respondents were males and 155 persons representing 29.36% were female. Given the random nature of the interview and the voluntary participation of respondents, the results show that more males were readily available to take part in the study. Again, males were more vocal in expressing their views on the Sargassum invasion compared to their female counterparts. This is also partly due to the male dominance in decision-making in most households in these communities. Also, 397 of the total respondents were from the western region, which is the most invaded region. The remaining respondents were taken from the central region where Sargassum species occasionally surface at

their beaches. The central region was used as a reference group in comparing the invaded community to the uninvaded community. These are presented in the tables 5.2.3.1 to table 5.2.3.5 in the appendix.

5.2.4 Correlation Coefficient Matrix

The correlation coefficient matrix was constructed for the continuous variables in the dataset. This was done to check if either of the two continuous variables are highly corrected. This guided us in choosing the variables used in the regression analysis to avoid variables that are highly correlated in a single model for our estimations. The correlation matrix is presented in Table 5.2.1 in the appendix. We used variables which had a correlation coefficient of less than 0.35 in each model estimation.

5.3 Regression Results and Discussions

5.3.1 Logistic Regression Results – Willingness to Pay (Money) For Sargassum Control in Ghana.

We estimate a logistic regression model to identify the possible factors that influence the willingness to pay money decisions of the respondents. This was done by creating a dummy variable 'POSITIVE WTP' which included all positive responses for willingness to pay including non-protest zeros. The explanatory variables were then selected based on both theory and past studies on willingness to pay. A correlation coefficient matrix was also created for the variables to also correct multicollinearity among the variables used in our estimation. The result of the logistic regression is presented in the table below.

Table 5.3.1 Logistic regression results – willingness to pay (WTP-Money) for Sargassum control in Ghana.

VARIABLE	MOD 1	MOD 2	MOD 3	MOD 4	MOD 5
Western Region	*0.535***	*.833****	*0.846****	*0.624***	*0.533***
	(1.97)	*(3.35)*	*(3.54)*	*(2.14)*	*(2.00)*
EDUCATION LEVEL:					
Primary Edu	*0.609***	*0.567***	*0.530**	*0.623***	*0.577***
	(2.11)	*(1.98)*	*(1.87)*	*(2.00)*	*(2.02)*
Jnr high Edu	*0.577**	*0.557**	*0.499*	*0.491*	*0.457*
	(0154)	*(1.74)*	*(1.58)*	*(1.48)*	*(1.46)*
Snr high Edu	*0.154*	*0.123*	*0.0578*	*-0.0905*	*-0.0163*
	(0.36)	*(0.28)*	*(0.14)*	*(-0.20)*	*(-0.04)*
Tertiary Edu	*1.034*	*0.981*	*1.024**	*1.537**	*0.882*
	(1.61)	*(1.53)*	*(1.86)*	*(1.82)*	*(1.41)*
EMP. STATUS					
Full- time	*1.589****	*1.428****	*1.334****	*1.942****	*1.561****
	(3.39)	*(3.13)*	*(3.03)*	*(3.37)*	*(3.51)*
Part-time	*1.581****	*1.393***	*1.332***	*1.744****	*1.535****
	(2.74)	*(2.46)*	*(2.40)*	*(2.58)*	*(2.71)*
Student	*1.034*	*0.877*	*0.841*	*1.405*	*1.020*
	(1.50)	*(1.28)*	*(1.27)*	*(1.78)*	*(1.54)*
Apprentice	*1.156**	*1.068 **	*1.054**	*1.575***	*1.191**
	(1.77)	*(1.67)*	*(1.67)*	*(2.16)*	*(1.90)*
Retired/pensioner	*0.905*	*0.241*	*0.216*	*0.497*	*1.014*
	(1.13)	*(0.32)*	*(0.29)*	*(0.57)*	*(1.30)*

ECO. ACTIVITY					
Fishing/monger	*-0.659*	*-0.746*			*-0.690*
	(-0.58)	*(-0.64)*			*(-0.63)*
Professional job	*-0.685*	*-0.786*			*-0.762*
	(-0.53)	*(-0.60)*			*(-0.61)*
Student/Apprentice	*-0.777*	*-0.917*			*-0.896*
	(-0.60)	*(-0.70)*			*(-0.72)*
Farming	*0.0226*	*0.113*			*0.0497*
	(0.02)	*(0.08)*			*(0.04)*
Petty trading	*-1.107*	*-1.084*			*-1.112*
	(-0.87)	*(-0.83)*			*(-0.90)*
Small bus. owner	*-1.869*	*-1.816*			*-2.025*
	(-1.40)	*(-1.34)*			*(-1.58)*
Artisans	*-1.578*	*-1.634*			*-1.478*
	(-1.25)	*(-1.27)*			*(-1.21)*
MALE	*0.0656*	*0.0401*	*0.0866*		
	(0.25)	*(0.15)*	*(0.34)*		
MARITAL STATUS					
Unmarried	*0.0758*	*0.123*	*0.0208*		
	(0.20)	*(0.33)*	*(0.06)*		
Divorced	*1.145***	*0.947**	*0.901**		
	(2.16)	*(1.81)*	*(1.75)*		
Widowed	*0.368*	*0.291*	*0.290*		
	(0.86)	*(0.68)*	*(0.68)*		
Realistic WTP-	*-2.653****	*-2.622****	*-2.653****	*-2.729****	*-2.637****
money policy	*(-5.85)*	*(-5.77)*	*(-5.93)*	*(-5.03)*	*(-5.84)*
Yrs of residence	*-0.0232****				*-0.0198***
	(-2.89)				*(-2.50)*
ENUMERATORS	*-0.104*	*-0.108*	*-0.0868*		
	(-0.49)	*(-0.51)*	*(-0.42)*		

HHSIZE		*-0.0640*	*-0.0576*	*-0.0526*	*-0.0579*
		(-1.63)	*(-1.51)*	*(-1.24)*	*(-1.48)*
EXPENDITURE				*0.000141*	
				(0.48)	
EFFECT_COMM.				*-0.587*	
				(-1.00)	
_cons	*1.853*	*1.782*	*1.061*	*0.920*	*2.299*
	(1.51)	*(1.42)*	*(1.57)*	*(1.13)*	*(1.93)*
N	*512*	*512*	*521*	*450*	*512*
R^2-Adjusted	*0.198*	*0.189*	*0.187*	*0.192*	*0.192*
AIC	*588.327*	*594.186*	*588.155*	*480.792*	*583.899*
BIC	*694.285*	*700.144*	*664.759*	*542.431*	*672.904*

t statistics in parentheses
** $p<0.1$, ** $p<0.05$, *** $p<0.01$*

The results from our estimation indicate that the employment status of respondents can influence the decision on the willingness to pay (money) to control the Sargassum invasion in Ghana. Compared to the unemployed, people with full-time and part-time jobs have high odds of contributing money to support the suggested program as a means of controlling Sargassum. While the full-time employment coefficient is significant at a 1% level, that of part-time employment is significant at a 5% level. This leads us to reject the hypothesis H3.1.2 and conclude that people who have either full-time or part-time employment have high odds to contribute money and significantly affect the decision on the willingness to pay (money) in the control of Sargassum. This is not a deviation from our expectations since we believe they earn extra income and can contribute to controlling the Sargassum invasion in their community.

Additionally, a plausible reason could be that the full-time and part-time employed in society are more likely to have higher income levels. This will mean that they will have high opportunity cost for their time and promote decisions on paying money to control Sargassum invasions. Moreover, their income levels are more at risk during the peak of invasions and may want to prevent such occurrences. Another reason could be that since they can pay, they will prefer paying to control Sargassum to prevent a fall in their income. A previous study by Maloma and Sekatane (2014) to investigate determinants of willingness to pay in South Africa found related results and concluded that employment and poverty status were significant determinants of willingness to pay. Another study by Ofori and Rouleau (2020) investigated income heterogeneity and willingness to pay to control Sargassum has also found that high-income households in Ghana were willing to pay Gh 59 to manage seaweed in Ghana. Our current result shows similarity with the above where persons with full-time or part-time employment have high odds of contributing money in controlling Sargassum invasion.

Another variable significantly affecting the willingness to pay is the respondent's region. The study found that compared to a resident in the central region of Ghana, a resident in the western region has high odds of positively contributing money to control Sargassum. A situation that gives ground to reject the hypothesis H3.1.1 and conclude that the level of invasion in the community plays an important role in deciding to contribute money for Sargassum control in Ghana. As shown earlier in fig 2.1.1 this region has the highest invasion of Sargassum. This also means it is one of the most affected in terms of environment, economic activities, and all challenges that come with the Sargassum invasion in Ghana. During the interviews, we found that most people in the communities, though not in support of paying money, showed much interest in the decision to control the Sargassum invasion within their community. They always indicated how the invasion of Sargassum is affecting their daily fishing business and livelihoods. In the central region, however, where the scenarios were more of a hypothetical one, most respondents were also against any money payment. Respondents from both region gave the impression of the need for assistance from authority rather than being made to pay money in the control of Sargassum.

Pate and Loomis (1997), in a study conducted on Wetlands and Salmon in California on the effect of distance willingness to pay values, found out that out of three programs distance had an effect on people’s willingness to pay. Our findings is similar to their study results since most respondents who live with the problem of Sargassum invasion have high on willingness to pay (money) decisions.

We also estimate how education levels influence the decision on the willingness to pay to control Sargassum in Ghana. We found that compared to the people with no education, those who have either primary school education have a high support for the decision of paying money to control Sargassum. In our study, respondents with higher levels of education did not show much support for financial payments to the control of Sargassum, as opposed to an earlier study by Tianyu and Meng (2020) who found that people with higher levels of education had much desire in paying environmental WTP-money in China. To support our findings, we reason that most of the people with these lower education levels are the main residents of the affected communities, who spend more productive hours in these affected towns and even engage in various economic activities. Most of them are fishers, fish mongers, and food vendors among others and they face the direct consequence of the Sargassum invasion. Unlike the highly educated ones who are more likely to find alternative economic activities or even relocated to the city centers to reduce the effect of the Sargassum invasion. We reasoned from the above that the most vulnerable in the affected communities are willing to control the Sargassum invasion. Again, it is also worth noting that if we assume that higher education has any correlation with employment, then attaining higher education itself is not enough but gaining employment either full-time or part-time might influence the willingness to pay in addressing environmental challenges including Sargassum invasion along the coast of Ghana.

We also tested the perceived effectiveness of the WTP-money scenarios presented to the respondents in the survey and whether it can influence their decision on willingness to pay such WTP-money to control Sargassum. The result shows an admission that the WTP-money scenario presented is more likely to be an effective tool in addressing the Sargassum invasion. However, the result shows a negative influence on the willingness to pay. Thus, the odds of paying WTP money to control the Sargassum invasion get lower regardless of the perceived effectiveness of the policy. We believe that the average Ghanaian is burdened with several WTP money and since those WTP money are paid to the central government to facilitate development, people find it difficult to adhere to any new payments when their existing concerns are not addressed by the government. In support of our findings, Oh and Hong (2012) indicated that citizens' trust in the government influences their willingness to pay, so governments should be cautious when making their expenditures, to be able to make accounts.

The number of years a respondent had spent in the community also affected their willingness to contribute money in the control of Sargassum. Contrally to our expected results, the study showed that respondents with long years of residents in the community had lower odds of paying to control Sargassum invasion. We realized during the interview that respondents who have lived in the community for a long time have witnessed the green algae invasions and the claim that it was naturally eradicated without any measures from either the government or institution. These respondents believe that Sargassum has come naturally and will similarly disappear naturally and see payment of WTP-money as another means burden from the government. A section of the respondents who have also lived with Sargassum invasions for more years did not see the need to pay for its control now because they adapted well to the effects of the Sargassum invasion.

In summary, the study has found that full-time and part-time employed respondents will contribute money to controlling the Sargassum invasion. Respondents in the western region also tend to contribute to controlling the Sargassum invasion. Also, respondents with basic education (primary and junior high) have a higher desire to pay to control the Sargassum invasion. While the WTP-money policy is realistic to many respondents, their desire to pay is low due to the government's inability to account for taxpayers' money. The number of years respondents have lived in the community also plays a significant role but, in our study, the longer a respondent has stayed in the community the less desire they have to contribute in monetary terms to controlling the Sargassum invasion.

Table 5.3.2 Logistic regression results – willingness to pay (time) for Sargassum control in Ghana.

VARIABLE	*MOD 1*	*MOD 2*	*MOD 3*	*MOD 4*	*MOD 5*
Western Region	*-0.0141*	*-0.0615*	*0.124*	*0.301*	*0.755*
	(-0.04)	*(-0.17)*	*(0.38)*	*(0.87)*	*(1.49)*
EDUCATION:					
Primary Edu	*0.454*	*0.499*	*0.485*	*0.468*	*0.388*
	(1.13)	*(1.18)*	*(1.17)*	*(1.09)*	*(0.62)*
Jnr high Edu	*0.536*	*0.642*	*0.513*	*0.666*	*0.933*

	(1.18)	*(1.38)*	*(1.13)*	*(1.34)*	*(1.35)*
Snr high Edu	*-0.168*	*-0.0540*	*-0.491*	*-0.122*	*-0.754*
	(-0.32)	*(-0.10)*	*(-0.99)*	*(-0.22)*	*(-1.06)*
Tertiary edu	*-1.051**	*-1.027**	*-1.556****	*-1.295***	*-1.466***
	(-1.87)	*(-1.76)*	*(-3.24)*	*(-2.38)*	*(-2.16)*
EMP. STATUS					
Full- time	*-0.408*	*-0.295*	*-0.459*	*-0.187*	*-1.688*
	(-0.69)	*(-0.48)*	*(-0.79)*	*(-0.31)*	*(-0.99)*
Part-time	*0.321*	*0.523*	*0.284*	*0.421*	*-1.097*
	(0.40)	*(0.61)*	*(0.35)*	*(0.51)*	*(-0.60)*
Student	*-0.927*	*-0.980*	*-0.601*	*0.0755*	*-0.623*
	(-1.07)	*(-1.11)*	*(-0.69)*	*(0.07)*	*(-0.29)*
Apprentice	*1.461*	*1.712*	*0.866*	*0.0105*	*0.701*
	(1.01)	*(1.00)*	*(0.64)*	*(-0.06)*	*(0.52)*
Retired/pensioner	*-2.553****	*-2.895****	*-3.218****	*-3.203****	*-4.845***
	(-2.84)	*(-2.95)*	*(-3.39)*	*(-3.27)*	*(-2.845)*
Realistic labour	*3.063****	*2.952****	*2.799****	*2.817****	
policy	*(7.25)*	*(7.05)*	*(8.02)*	*(7.34)*	
YRS_SARG		*-0.164****	*-0.165*	*-0.163****	*-0.243****
visibility		*(-2.92)*	*(-3.52)*	*(-3.20)*	*(-3.37)*
HHMINORS		*0.240****	*0.238****	*0.220***	*0.347***
		(2.66)	*(2.71)*	*(2.31)*	*(2.52)*
Effect on fishing				*-1.332****	*-1.815****
				(-2.98)	*(5.64)*
Yrs of residence	*-0.0240****	*-0.00731*			

	(-2.58)	*(-0.66)*			
ECO. ACTIVITY					
Fishing/monger	*0.934*	*1.439*			
	(0.74)	*(1.12)*			
Professional job	*-0.169*	*0.400*			
	(-0.13)	*(0.29)*			
Student/Apprentice	*1.203*	*1.584*			
	(0.73)	*(0.96)*			
Farming	*0.385*	*0.589*			
	(0.24)	*(0.36)*			
Petty trading	*-0.297*	*-0.0651*			
	(-0.21)	*(-0.04)*			
Tourism	*-1.369*	*-0.748*			
	(-0.96)	*(-0.51)*			
Small business owner	*-0.804*	*-0.0443*			
	(-0.54)	*(-0.03)*			
Artisans	*-1.017*	*-0.719*			
	(-0.74)	*(-0.51)*			
Realistic WTP-money policy	*-0.206*				
	(-0.57)				
Unmarried			*-0.171*	*-0.111*	*0.380*
			(-0.39)	*(-0.23)*	*(0.55)*
Divorced			*0.308*	*0.333*	*-0.473*
			(0.37)	*(0.39)*	*(-0.40)*
Widowed			*-0.115*	*-0.101*	*1.356*
			(-0.20)	*(-0.17)*	*(1.22)*
ENUMERATORS			*0.480**	*0.538**	*0.148*
			(1.67)	*(1.71)*	*(0.34)*
Linc					*0.608**

					(1.76)
_cons	*-0.642*	*-0.876*	*0.122*	*-0.0690*	*-2.456*
	(-0.46)	*(-0.61)*	*(0.16)*	*(-0.09)*	*(-0.81)*
N	*519*	*516*	*516*	*475*	311
R^2-Adjusted	*0.307*	*0.340*	*0.305*	*0.330*	*0.321*
AIC	*400.368*	*377.297*	*382.732*	*333.024*	*334.712*
BIC	*493.909*	*479.203*	*459.162*	*407.963*	*452.111*

t statistics in parentheses
** $p<0.1$, ** $p<0.05$, *** $p<0.01$*

The table above shows an estimation of the willingness to contribute labour hours (time) in controlling the invasion of Sargassum in Ghana. Evidence from previous studies on the environment has shown that the use of non-monetary payment is an effective tool in addressing environmental problems. This is an alternative to monetary payments which will help address the Sargassum invasion in Ghana. The result shows that respondents with tertiary education as compared to the uneducated, are less enthused when offered the choice of contributing labour time in controlling Sargassum. This is shown by the negative and significant coefficient estimate for the tertiary education variable in the estimation. We reject the hypothesis H4.1.1 and conclude that persons with high education are less likely to offer support for decision to contribute labour time for the control of Sargassum invasion in Ghana. A likely reason could be that these highly educated persons do not mostly live in the highly affected communities to offer their labour time in controlling the Sargassum invasion. Again, it could also be that those with higher education have a higher opportunity cost of their time and would prefer the opportunity cost to provide time for Sargassum invasion. Depending on the opportunity cost related to offering labour time, a full-time educated worker will prefer paying money to offering labour time . Echessah et.al (1997), in a survey conducted in the Busia community in Kenya found that respondents who were highly educated were less likely to contribute labour to control tsetse fly invasion, they were more inclined to pay money for the control.

The retired in the communities also have lower odds when it comes to contributing labour hours for the control of Sargassum.The result for this variable is 1% significant for all the models and shows a negative relation with the dependent variables. A likely reason could be that these are grown-ups in society who in most instances are not strong enough to engage in communal labour activities and cleaning of Sargassum in the coma munity. The result is like our expectations because pensioners are a low-income group in developing countries and more likely weak in health status. These make them less active in addressing the concerns of the environment such as Sargassum invasion.

Respondents perceived the labour scenario as a significant policy which influences their decision for the contribution of labour time in controlling the Sargassum invasion. This is indicated by the positive and significant relation of the realistic labour policy variable in all the estimated models. A plausible reason could be that the respondents are used to this kind of societal activity and so offering one's time for such a clean-up exercise is an incentive compared to payment of money to address the Sargassum invasion.

Heloorlt-Postulart et.al, (2009) found a lot of protest responses when they conducted a willingness to pay to a willingness to contribute labour because respondents found the latter to be more realistic.

Willingness to contribute labour decision is positively related to the number of minors available in a household. The household minor variable is positive and statistically significant at 5% in all the estimated models. Households that have more minors have high odds of contributing labour hours in controlling the Sargassum invasion. A likely reason could be that cleaning Sargassum from the beach is something that the minors can engage in without any harm and households will prefer the minors to engage in the Sargassum cleaning while they engage in other income-generating activities such as deep-sea fishing among others to support the financial needs of the household.

Years of Sargassum Visibility is another significant determinant of positive willingness to contribute labour to control Sargassum invasion in Ghana. The variable is statistically significant at 5% level and an increase in the years of Sargassum visibility will reduce the odds of contributing labour to control Sargassum. Respondents might have built resistance to the effects of the Sargassum invasion and are not more interested in offering labour hours for the control of Sargassum.

We also estimated how the Sargassum invasion might affect the willingness to contribute labour because of how the invasion is affecting fishing activities. The results show a significant but negative relation with the willingness to contribute labour for the control of the Sargassum invasion. Despite the effects of Sargassum invasion on fishing-related activities, the odds of contributing labour in controlling Sargassum decreases with these effects. Participants of the study feel neglected if they must address the Sargassum invasion with their own strength. They feel they should be compensated and assisted by the government in controlling the invasions in the community and not have to use their labour time in controlling it.

Table 5.3.3 Linear regression results – willingness to pay (money) for Sargassum control in Ghana.

VARIABLE	*MOD 1*	*MOD 2*	*MOD 3*	*MOD 4*	*MOD 5*
Western Region	*-43.00****	*-43.29****	*-45.43****	*-41.71****	*-41.69****
	(-5.99)	*(-6.30)*	*(-6.53)*	*(-5.66)*	*(-5.67)*
EDUCATION:					
Primary Edu	*-1.390*	*-1.315*	*-2.354*	*-2.454*	*-2.396*
	(-0.22)	*(-0.22)*	*(-0.38)*	*(-0.39)*	*(-0.38)*
Jnr high Edu	*17.12***	*17.50***	*14.52***	*14.80***	*14.88***
	(2.44)	*(2.58)*	*(2.15)*	*(2.14)*	*(2.16)*
Snr high Edu	*-1.979*	*-2.441*	*-5.202*	*0.197*	*0.252*
	(-0.21)	*(-0.28)*	*(-0.59)*	*(0.02)*	*(0.03)*
Tertiary edu	*5.638*	*4.879*	*3.751*	*-3.766*	*-3.647*
	(0.53)	*(0.48)*	*(0.35)*	*(-0.34)*	*(-0.34)*
YRS_SARG	*4.450****	*4.369****	*4.322****	*4.329****	*3.886****
visibility	*(4.64)*	*(4.68)*	*(4.52)*	*(4.53)*	*(3.74)*
Yrs. of residence	*-0.537***	*-0.555***	*-0.641****	*-0.632****	*-0.594****
	(-2.47)	*(-2.56)*	*(-2.92)*	*(-2.92)*	*(-2.67)*
Realistic WTP-	*-14.11****	*-14.08****	*-12.23***	*-12.20***	*-12.32***
money policy	*(-2.72)*	*(-2.77)*	*(-2.33)*	*(-2.32)*	*(-2.31)*
EMP. STATUS					
Full-time	*-7.762*	*-5.538*			
	(-0.53)	*(-0.39)*			

Part-time	*-25.38*	*-23.49*			
	(-1.56)	*(-1.47)*			
Student	*-13.23*	*-13.19*			
	(-0.73)	*(-0.74)*			
Apprentice	*-11.72*	*-11.30*			
	(-0.67)	*(-0.66)*			
Retired/Pensioner	*-19.58*	*-20.20*			
	(-0.86)	*(-0.91)*			
ECO. ACTIVITY					
Fishing/monger	*-28.84*	*-30.30*	*-22.82*	*-22.21*	*-39.83*
	(-1.10)	*(-1.18*	*(-0.90)*	*(-0.88)*	*(-1.31)*
Professional job	*-0.615*	*-1.092*	*15.66*	*16.19*	*0.684*
	(-0.02)	*(-0.04)*	*(0.58)*	*(0.60)*	*(0.02)*
Student/Apprentice	*-16.24*	*-17.56*	*-9.317*	*-8.947*	*-51.01*
	(-0.54)	*(-0.60)*	*(-0.32)*	*(-0.30)*	*(-1.40)*
Farming	*-8.389*	*-8.542*	*4.486*	*5.402*	*-11.87*
	(-0.27)	*(-0.28)*	*(0.14)*	*(0.17)*	*(-0.33)*
Petty trading	*-11.03*	*-12.77*	*-0.311*	*0.356*	*-17.75*
	(-0.37)	*(-0.44)*	*(-0.01)*	*(0.01)*	*(-0.53)*
Tourism	*38.65*	*37.40*	*55.20**	*55.57**	*35.86*
	(1.31)	*(1.29)*	*(1.91)*	*(1.92)*	*(1.06)*
Small business owner	*74.63***	*70.38***	*78.62***	*79.56***	*46.85*
	(2.03)	*(2.01)*	*(2.30)*	*(2.33)*	*(1.11)*
Artisans	*-42.62*	*-43.62*	*-40.79*	*-40.72*	*-62.51**
	(-1.43)	*(-1.48)*	*(-1.40)*	*(-1.39)*	*(-1.82)*
MALE	*6.809*	*7.270*	*10.24**	*10.30**	*9.010*
	(1.21)	*(1.33)*	*(1.79)*	*(1.80)*	*(1.64)*
HHSIZE	*0.181*			*0.335*	*0.343*

	(0.18)			*(0.35)*	*(0.35)*
Marital status					
Unmarried	*-3.470*				
	(-0.42)				
Divorced	*-4.468*				
	(-0.43)				
Widowed	*-4.242*				
	(-0.43)				
ENUMERATORS	*-5.939*	*-6.156*	*-6.242*	*-6.333*	*-6.080*
	(-1.27)	*(-1.33)*	*(-1.31)*	*(-1.33)*	*(-1.26)*
PRV_MIAS	*-3.376*				
	(-0.51)				
HHADULTS		*0.349*	*0.584*		
		(0.24)	*(0.41)*		
EFFECT_SAR~M			*2.510*	*2.195*	
			(0.14)	*(0.13)*	
HOUSEHOLD			*-0.586*	*-0.727*	
HEAD			*(-0.07)*	*(-0.08)*	
EXPENDITURE				*0.00813*	*0.00815*
				(1.31)	*(1.31)*
_cons	*104.9****	*103.4****	*89.90****	*103.2****	*101.8****
	(3.74)	*(3.77)*	*(3.16)*	*(3.00)*	*(3.30)*
N	*335*	*335*	*321*	*321*	*310*
R^2-Adjusted	*0.344*	*0.342*	*0.351*	*0.351*	*0.338*
AIC	*3469.295*	*3462.052*	*3316.816*	*3316.862*	*3201.316*
BIC	*3579.905*	*3557.405*	*3399.787*	*3399.834*	*3283.420*

t statistics in parentheses
** p<0.1, ** p<0.05, *** p<0.01*

The study tried to unravel any linear relationship between the amount of money people are willing to pay (money) and other variables of the study. This was done to address the study's third objective, which seeks to identify some of the determinants of the stated amounts people are willing to pay in the community of study. The estimates for models with the same dependent but varying explanatory variables are presented in Table 5.3.3 above.

The result shows that compared to the residents from the central region of Ghana, the amount of money that people are willing to pay to control the Sargassum invasion reduces for residents in the western region of Ghana. The estimated coefficient is negative and statistically significant at 1% for all the estimated models. We fail to accept the null hypothesis H3.2.1 and conclude that the amount of money people are willing to pay is lower for the western region. This is the reverse of our expectation since we expected the most invaded community to have a positive relation with the amount of money to control the Sargassum invasion. We infer from our interactions with the respondents that the invasion of Sargassum has already reduced the income levels of the people in the western region and most of the affected community members have very low incomes to pay for the control of Sargassum. Again, it could also be the case that the residents in the western region feel that they should be compensated or supported because of the effects of the Sargassum invasion, this has informed their decision to offer less in terms of payment to control the invasion. It is also possible that they have a lower willingness to pay because they feel they have not in any way contributed to the cause of the Sargassum invasion which may be justified because environmental WTP-money, according to the Pigouvian taxation as stated in Baumol (1972), Tax is mostly meant to correct externalities(pollution) by an economic agent. Thus, the polluter pay principle exonerates these residents from paying the WTP money when they have not been identified as polluters (cause of the Sargassum invasion). Baumol (1972) has also suggested that WTP money by the affected individual from an externality is not ideal.

We estimated how the level of education of the respondent might also influence the amount paid for the control of Sargassum. Among the different levels of education stated persons with junior high education levels compared to those with no education were more likely to pay higher money for controlling the Sargassum invasion. This is shown by a positive and a 5% significant estimated coefficient for this level of education. We fail to accept the null hypothesis H3.2.2 and we conclude that higher education does not necessarily lead to higher payment of money for the control of Sargassum in the community. A possible reason could be that respondents with this level of education are more likely to stay in the community and in most cases be made smaller community leaders. This means that they may want to lead by example in making payments in addressing community challenges unlike the other persons with higher education levels who are more likely to gain employment outside their communities considering that the main occupation available in these communities are mostly fishing and farming.

The years of Sargassum visibility are also positively related to the amount of money people are willing to pay to control Sargassum. The results show a 5% significant estimate for the variable in the models. We believe that persons who have seen Sargassum for many more years without any support in controlling the invasion might want to contribute more money to controlling Sargassum. This is even more likely to be true when the invasion is considered much more devastating to the residents in the affected communities. A contrasting result is found for the years of residence by the respondents. The willingness to pay money for controlling the Sargassum invasion decreases for respondents who have stayed longer years in the community. The result is statistically significant and negatively related to the dependent variable as indicated in Table 5.3 above. An interpretation could be that persons who live longer years might have either adapted to the effects of the Sargassum invasion or might have experienced other invasions which did not require monetary payments in controlling those invasions. This will also mean that such respondents will be very reluctant to make financial payments for the control of Sargassum.

While acknowledging the reality of the WTP-money scenario presented to respondents in the study. The estimated coefficient is both negative and statistically significant at the 1% level. A possible reason for this outcome could be that respondents who see the project as much more realistic state lower amounts to pay so that they are able to pay during actual implementation while those who doubt the feasibility of the project state a high amount knowing well that this project will not be realistic and they are not going to pay the amount of money they have stated. Also, from our interaction with respondents during the interview, we realized most people feel burdened by the government through taxation on fuel (premix) and very little benefit since the Sargassum invasion in their community. These complaints make the respondent feel that payment of extra money to address their own challenges is not an ideal solution to the problem at hand. The negative perception of tax payment in general, is a major contributing factor to the negative relation estimated in the results above.

Small business owners are also likely to pay more money for the control of Sargassum in their community. The result shows a 5% significance level for this variable. The success of these businesses is dependent on the overall well-being of the community. Hence cleaning Sargassum in a major priority for these businesses due to the indirect benefits to their activities in the community. Again, their willingness to contribute money forms part of their social responsibility towards the community they operate and this is not entirely surprising that they are willing to pay more money in the cleaning of Sargassum in the affected community they operate.

Table 5.3.4 Linear regression results – willingness to pay (Time) for Sargassum control in Ghana.

VARIABLE	*MOD 1*	*MOD 2*	*MOD3*	*MOD4*	*MOD 5*

EDUCATION					
Primary	*5.093***	*5.878***	*5.511***	*5.523***	*3.850*
	(2.01)	*(2.32)*	*(2.21)*	*(2.19)*	*(1.54)*
Jnr high	*4.601*	*6.100***	*5.352**	*5.317**	*4.475*
	(1.59)	*(2.13)*	*(1.87)*	*(1.80)*	*(1.54)*
Snr high	*3.023*	*3.718*	*3.325*	*2.969*	*-0.379*
	(0.76)	*(0.96)*	*(0.86)*	*(0.72)*	*(-0.09)*
Tertiary	*1.724*	*3.239*	*2.474*	*3.581*	*-1.280*
	(0.31)	*(0.58)*	*(0.44)*	*(0.62)*	*(-0.22)*
YRS_SARG.	*0.292*	*-0.132*	*0.0303*	*0.606**	*0.343*
visibility	*(0.72)*	*(-0.33)*	*(0.08)*	*(1.73)*	*(0.93)*
EMP. STATUS					
Full-time	*-3.591*	*-1.984*	*-3.123*	*-1.636*	*-3.646*
	(-0.80)	*(-0.47)*	*(-0.73)*	*(-0.38)*	*(-75)*
Part-time	*-1.287*	*-0.224*	*-0.924*	*0.431*	*-0.707*
	(-0.24)	*(-0.04)*	*(-0.18)*	*(0.08)*	*(-0.12)*
Student	*-14.09***	*-14.16***	*-15.09***	*-13.60***	*-12.38**
	(-2.21)	*(-2.32)*	*(-2.47)*	*(-2.14)*	*(-1.71)*
Apprentice	*-4.910*	*-5.419*	*-6.349*	*-5.818*	*-3.300*
	(-0.83)	*(-0.94)*	*(-1.11)*	*(-0.99)*	*(-0.52)*
Retire/pensioner	*-33.17****	*-29.68***	*-29.90***	*-27.42***	*-25.69***
	(-2.70)	*(-2.42)*	*(-2.43)*	*(-2.20)*	*(-2.11)*
MALE	*5.271***	*6.379***	*5.322***	*6.150****	*4.885****
	(2.08)	*(2.54)*	*(2.34)*	*(2.60)*	*(2.06)*
YRS.OF	*0.248****	*0.258****	*0.239****		
RESIDENCE	*(3.02)*	*(3.19)*	*(2.97)*		
ECO. ACTIVITY					
Fishing/monger	*4.051*	*5.004*	*4.473*	*3.791*	*-4.531*
	(0.39)	*(0.49)*	*(0.43)*	*(0.36)*	*(-0.39)*
Profession job	*-6.612*	*-7.108*	*-7.504*	*-8.337*	*-15.91*

	(-0.58)	(-0.63)	(-0.66)	(-0.73)	(-1.30)
Student/Apprentice	9.214	10.18	10.45	9.649	-6.059
	(0.77)	(0.88)	(0.90)	(0.82)	(-0.44)
Farming	-2.545	-2.904	-2.914	-3.993	-12.93
	(-0.19)	(-0.22)	(-0.22)	(-0.30)	(-0.93)
Petty trading	12.38	15.30	15.28	13.78	-4.595
	(0.97)	(1.22)	(1.21)	(1.08)	(-0.33)
Tourism	25.75*	27.60**	26.62**	25.07*	16.22
	(1.93)	(2.05)	(1.99)	(1.85)	(1.14)
Small business owner	17.28	14.41	15.73	12.99	-4.154
	(1.32)	(1.10)	(1.20)	(0.97)	(-0.23)
Artisans	27.21**	21.71*	22.14*	19.08	2.307
	(2.17)	(1.80)	(1.83)	(1.57)	(018)
HHMINORS	-0.676	-0.664	-0.665	-0.576	-0.692
	(-1.18)	(-1.17)	(-1.17)	(-0.99)	(-1.19)
REALISTIC	-2.162	-2.698	-0.0109	-0.769	
POLICY LAB.	(-0.43)	(-0.54)	(-0.00)	(-0.16)	
HOUSEHOLD_~D	3.576	4.243			
	(0.98)	(1.21)			
Effect fishing				-6.562	
				(-0.88)	
effect_env’t		3.446*	2.730	3.570*	2.400
		(1.68)	(1.34)	(1.72)	(1.05)
effect_water		-0.721	-0.717	-1.125	-1.116
		(-0.68)	(-0.67)	(-1.05)	(-1.04)
MARITAL _ STATUS					
Unmarried				1.662	1.986
				(0.47)	(0.55)

Divorced				*8.923***	*10.000****
				(2.03)	*(2.31)*
Widow				*2.682*	*3.633*
				(0.63)	*(0.88)*
EXPENDITURE		*0.0110****			*0.0119****
		(4.31)			*(4.63)*
_cons	*25.28**	*23.16**	*27.75***	*27.04***	*32.48***
	(1.95)	*(1.76)*	*(2.34)*	*(2.24)*	*(2.44)*
N	403	415	418	418	386
R^2-Adjusted	0.155	0.163	0.152	0.342	0.189
AIC	3531.710	3658.891	3686.792	3462.052	3378.842
BIC	3635.553	3767.654	3787.679	3557.405	3489.605

t statistics in parentheses
** $p<0.1$, ** $p<0.05$, *** $p<0.01$*

We estimated a linear relation between the amount of time people are willing to contribute labour time (hours) for the cleaning of Sargassum and some determinants. Our estimated results show that persons with lower levels of education relative to those with no education significantly influence the total number of hours offered for controlling Sargassum. This variable has a positive relation with the number of hours offered for Sargassum control and it is significant at 1% level. This is similar to our expectation because we projected that persons with lower levels of education are more likely to get directly involved in various activities along the coast of Ghana especially fishing-related activities. We fail to reject the null hypothesis H4.2.1 and conclude that persons with lower education are more likely to offer labour hours (time) for the control of Sargassum in their community. Again, from the earlier estimations, we established that the two policies of controlling Sargassum invasion have been supported by persons with lower levels of education who face the direct consequences of the invasion.

We also found that males compared to females are more likely to offer more hours for the control of Sargassum invasion. The estimates show a 5% significance level for the estimated coefficient for the male variable. We also fail to accept the hypothesis H4.2.2 and conclude that males are more likely to offer more labour hours for the control of Sargassum than their females We believe that because the labour option of controlling Sargassum requires much physical strength. However, the female gender lacks the upper body strength needed for the cleaning exercise and so males are preferred the use of labour time for the control of Sargassum. Moreover, the pulling of fishing nets is mostly done by males in the community and since the burden of pulling nets full of Sargassum falls on males, they are more likely to offer more hours for the control to reduce the burden of working along the beach.

Years of stay in the community is another determinant of the willingness of the individual to offer labour hours for the control of Sargassum invasion. The estimate shows a positive relation between hours of willingness to pay and the years of stay by the respondents and it is significant at 5% level. We discovered that communal labour is occasionally organized by members of the community to address other environmental problems. Such organization has ever been used to clean Sargassum from the beach in one of the peak invasion times when the males dug the ground and the collected Sargassum is buried by the men in society. Persons who have stayed longer in the community are more likely to be used to the practice and will be willing to offer more labour hours for controlling the Sargassum invasion compared to persons who are new in the society.

Households who work in the tourism sector such as hotels and other recreational centers close to the beach are more likely to offer more labour hours for the control of Sargassum. Recreational centers are directly affected during peak invasions because Sargassum reduces the beauty of the coastline and most of these centers are forced to close or clean their area of operation at a high cost to the operators alone. It is not entirely surprising that these households have support for offering labour hours to control the Sargassum invasion since such a policy will reduce the cost of doing business along the coast and is more likely to be very effective since it will involve a lot more persons in the affected community.

Students and the retired in the community, however, have a negative relation with the willingness to contribute labour for the control of Sargassum. The estimates are negative and statistically significant. A possible interpretation of the above relation could be that the students have always been busy with studies and may not have additional time to engage in the Sargassum cleaning activities in their community. Again, since most of the schools are located outside the community, students use much travel time to and after school making them virtually unavailable for any community Sargassum cleaning exercise. The retired/pensioner also do not have enough strength to engage in community cleaning of Sargassum. They do not engage in active work and mostly do not deal directly with the effects of the Sargassum invasion. These results were expected by the researchers because we expected the weak and old in society to contribute less labour for the control of Sargassum since it involves much physical strength which the young and old members of the society do not readily have for a successful control program.

Interestingly, high-expenditure households are more likely to offer more labour hours for the control of Sargassum invasion. Centrally to our expectation where if expenditure is used as a proxy for income, then we will expect a negative relation between willingness to pay (time) and expenditure due to the opportunity cost of time, expenditure shows a positive and significant relation with the willingness to pay (time) in controlling Sargassum invasion. If expenditure is not used as a proxy for income, then one could reason that households with high expenditure will prefer not to add to their existing spendings and will prefer to offer labour hours for the cleaning of Sargassum.

CHAPTER SIX

Conclusion

In summary, this thesis embarked on a journey to explore the intricate relationship between human values, environmental conservation, and societal dynamics within the context of Sargassum invasion control in Ghana. Through a systematic and comprehensive analysis, the study unveiled compelling insights that contribute not only to the field of environmental economics but also to the broader discourse on sustainable resource management.

The central objectives of this research were successfully achieved, as the study effectively estimated the average monetary and labour contributions individuals are willing to make in the battle against the Sargassum invasion. By quantifying these contributions, the study highlighted the tangible commitment of the Ghanaian populace to safeguard their coastal ecosystems against this invasive threat. The study shows that the Ghanaian household in the study region is willing to pay Gh. 52.135 annual contribution towards the control of Sargassum. Again, we also estimated an average of 38 hours (5 working days) per household as the annual time for the control of the Sargassum invasion in Ghana.

Furthermore, the identification of determinants influencing willingness to pay or contribute labour added an invaluable layer of depth to our understanding. Notably, the findings underscore the influence of socioeconomic factors, revealing that individuals in full-time or part-time employment and those with lower educational backgrounds exhibit a heightened sense of responsibility toward environmental preservation.

While the full-time and part-time employed were willing to pay money for the control of Sargassum, persons with lower education levels were not only willing to pay money but also willing to contribute their labour hours for the control of Sargassum in Ghana. Moreover, the results show that the western region, which is the most affected coast in Ghana, has major support for both willingness to pay(money) and willingness to pay (time) scenarios compared to the Central region with few traces of Sargassum. We can conclude that people with higher education had less support for contributing labour to the control of the invasive Sargassum. Students and retired members of society showed a lower desire to contribute either money or labour hours in controlling the Sargassum invasion. With gender differences, males showed a higher preference for willingness to pay (time) for controlling sargassum, whilst both males and females did not show any significant outcome in the willingness to pay (money) models. Other factors such a the years of residence by the respondent, The years of residence, small business owners as well as households that work in the tourism sector show much support contributing labour for the control of sargassum invasion.

The prominence of the western region in the invasive invasion, coupled with its significant influence on willingness to pay and contribute labour, emphasizes the need for targeted interventions in this region.

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APPENDIX

A. QUESTIONNAIRE

ATTITUDES TOWARDS MARINE INVASIVE SPECIES (SARGASSUM) IN GHANA

A0. Information about the study

This survey is meant to elicit information on the attitudes towards marine invasive species in the central and western regions of Ghana. It is conducted in partial fulfillment of the Master of Science degree program at the Norwegian University of Life Sciences (NMBU) with support from the University of Cape Coast (UCC). The interview will take approximately 20 minutes of your time to complete. Your identity will not be recorded and the results from this survey will be presented as averages across all respondents interviewed and cannot be traced back to the individual respondent. We hope you will contribute to inform policy decisions on this topic by participating in this survey.

There are no right or wrong answers. Answer the questions as best as you can, reflecting your own views.

A1. Background information of respondents/community

1. How many years have you lived in this community?

Ans: …………………………………(years) (IF LESS THAN ONE YEAR WRITE “0”. IF THEY DO NOT LEAVE HERE, END INTERVIEW)

2. What do you think are the main economic activities of this community (list them below)

Ans: …………………………………………………………………...........

3. Which economic activities are you and your household involved in?

(CIRCLE ALL RELEVANT ACTIVITIES)

   1. Fishing/ fish Monger
   2. Professional job (teaching, nursing, public servant, etc.)

3. Student/apprentice
4. Farming
5. Petty trading/ food vendors
6. Tourism (hotel, restaurant, resorts)
7. Small business owner
8. Artisans (Tailors, Hairdressers, Carpenters, Masonry Driving, etc.)
9. Others (please specify) ....

4. How many people in total – adults and children - do you have in your household;- including yourself?

Ans: ....people.

5. How many of these are children (less than 18 years old) ?

Ans ....children in the household (WRITE "0" IF NO CHILDREN ARE IN THE HOUSEHOLD)

A2. Marine invasive alien species

Marine invasive alien species are plants and animals that are introduced either accidentally or deliberately into the part of the sea where they are not normally found. They cause changes to their new environment. If they find adequate conditions to survive, reproduce and spread, they can cause harm to other marine plants and animals and human livelihood. Some invasive alien species also provide benefits in the form of being harvestable fish species or biofuel.

6. Do you know of any new species in your environment that were previously not here?

   0. No
   1. yes

7. If “yes”, mention them.

Ans: ....

8. Have you ever seen this seaweed - Sargassum before (see picture below)

SHOW PICTURE 1

0. No
1. Yes

9. Do you find them in this community?

0. No
1. Yes
2. Don’t know.

10. If “Yes”, for how many years have you seen sargassum in this community?

Ans: 0, 1, 2, 3, Don’t know.

11. What can you say about the change in the quantity of sargassum in this community? Is there:

(READ ALTERNATIVES)

1. No change in quantity.
2. An increase in quantity.

3. A decrease in quantity.

4. Do not know.

12. IF ANSWERED "2" TO QUESTION 11: If you have noticed an increase in the Sargassum, which periods of the year do you notice this the most?

Ans: ....

13. In what ways does Sargassum affect you and your household's daily life and livelihood?

(TICK effects that apply to you and your household and whether the effects are positive or negative)

Activity	Impacts		
Name of activity	Positive	Negative	Not relevant
Fishing/fish monger			
Recreation			
Sand weaning			
Tourism			
Trading			
Water quality			
Environmental quality			
Stench			
Other;..........please specify:			

14. Do you think the overall impact of Sargassum in this community is positive, negative or none?

1. Positive
2. Negative
3. None/negligible

15. Does the presence of Sargassum have any effect on the income of your household?

    0. No
    1. Yes
    2. Do not know

16. IF ANSWERED “Yes” TO QUESTION 15, which period of the year is your income affected by the Sargassum invasion, and for how long?

    A. Month: 1= January 2 = February etc. .... 12 = December
    B. Random

B. Duration: .... no. of week

C. Approximately how large percentage of your household income do you think you loose on average during these periods?

Ans: 1. Less than a quarter (1/4) of income.

2. $^{1}/_{4}$ to $^{1}/_{2}$

3. More than $^{1}/_{2}$ of income,

4. Don’t know

A3.Existing control measures for Sargassum

17. Do you know any interventions by any agency/government meant to control the presence and spread of Sargassum?

    0. No, I know I do not know of any measures.

    1. Yes , I know measure

18. IF ANSWERED “Yes” TO QUESTION 17: Please list some of these control measures for Sargassum

Ans: ....

19. In your opinion how successful have the measures been?

1. Very successful
2. Somewhat successful
3. Somewhat unsuccessful
4. Very unsuccessful
5. Do not know.

20. What has been done by the community to reduce the invasion of Sargassum?

Ans: ....

21. What measure(s) have you and your household taken to reduce the impact of the sargassum invasion on your household?

Ans: ....

A4.Willingness to pay Questions.

SCENARIO A (WTP)

Considering the growth of Sargassum along the coastal region of Ghana, the government through the Ministry of Fisheries and Aquaculture (MOFAD) is considering to implement a program to control and manage Sargassum in the affected communities. This program Sargassum will be implemented at the local level, and it is expected that in the next 10 years, each community should have successfully implemented the program to prevent the spread of Sargassum from one community to the other. The program will involve the use of non-toxic chemicals, tools, and other resources to clean Sargassum both on the beaches and in the sea. This will also prevent future invasions of Sargassum and other alien species. The government is providing the technical support to lead the program, and they will be funded through donor support, industrial funding and an annual environmental tax to be paid by households within each community. Community heads together with an established committee will see to the efficient disbursement and implementation of the program and the entire fund will be used solely for the cleaning of the sargassum. The program will be a success if each household in the community is willing to make annual payments in the form of an environmental tax on each household.

The program when completed after 10 years will achieve a clean coastline, illustrated by moving from picture 1 to picture 2 where there will not be any Sargassum.

SHOW PICTURE I AND PICTURE 2

Picture 1 – Without the Sargassum Control Program (Current situation)

Picture 2 – With the Sargassum Control Program

22. Comparing the current situation and the result of the implementation above, which of these is your preferred choice

0. <u>Without the Sargassum Control program (Current situation). picture 1</u>
1. <u>With the Sargassum Control Program (picture 2)</u>

<u>*ASK QUESTIONS 23 TO ALL RESPONDENTS INDEPENDENT OF WHAT THEY ANSWERED IN Q 22*</u>

23. <u>*Think about what it is worth to you and your household to get rid of the Sargassum in your community*</u>. What, if anything, is the highest amount your household is willing to pay annually in the form of an annual environment tax to control Sargassum in your community? <u>*Remember that if you pay for this, you have less money to use for other things*</u>.

0. 0
1. 4
2. 8
3. 12
4. 18
5. 24
6. 30
7. 36
8. 42
9. 48
10. 54
11. 60
12. More than 60 Gh¢: please specify................
13. Don’t know

IF THE RESPONDENT ANSWERED Gh¢ 0 (year for 10 years), OR DON'T KNOW, ASK QUESTION 24.

IF THE RESPONDENT ANSWERED Gh¢ 12 OR MORE (FOR 10 YEARS) ASK QUESTION 25

24. What is the most important reason for you not being willing to pay anything, or that you don't know what you are willing to pay, to control sargassum in your community? Please choose the most important reason. (ONLY ONE REPLY OPTION IS ALLOWED)

SHOW CARD WITH REPLY OPTIONS

1. I cannot afford to pay anything.
2. I do not think I should pay for the control of the sargassum.
3. I do not trust the government.
4. Controlling the Sargassum invasion is not relevant to me.
5. I doubt the feasibility of the program.
6. I am happy seeing Sargassum along the coast and in the sea.
7. Sargassum is not a problem in my community
8. I think it is difficult to state the amount
9. I would like to contribute labor rather than pay a tax
10. Other reasons, please specify ____

25. Why are you willing to pay something to control the invasion of sargassum in your community?

Please choose the most important reason (ONLY ONE REPLY OPTION IS ALLOWED)

SHOW CARD WITH REPLY OPTIONS

1. I want a preserve, a clean environment in the ocean
2. I want to reduce the stench from the sargassum.

3. I want to increase fish catch in the community.

4. I want to see growth in my community.

5. others. please specify..

SCENARIO B (LABOUR)

Imagine that Instead of collecting environmental taxes from the households, the government would like to use local labor in controlling Sargassum. The program will last for 10 years and labor hours are offered at regular intervals. The program is intended to start with communities who are willing to contribute local labor to the program. Note that offering labor will mean that you will have limited time for other activities including income-generating activities. This program will also get rid of the Sargassum in your community and the outcome will be as in picture 2.

SHOW PICTURE 2 AGAIN

26. Considering that the above alternative does not involve any further monetary payments but will achieve the same result shown in picture 2, are you willing to contribute labor to control the invasion of the sargassum in your community?

0. No I am not willing to contribute labor.

1. yes, I am willing to contribute labor

ASK QUESTION 27 TO ALL RESPONDENTS INDEPENDENT OF WHAT THEY ANSWERED IN QUESTION 27

27. Think about What it is worth to you and your household to get rid of Sargassum in your communities. What, if any, labor time is your household willing to contribute annually to control Sargassum in your community? Note that offering labor will mean that you will have limited time for other activities including income-generating activities.

Person- hours per household per year for 10 years

0. 0

1. 4

2. 8

3. 12

4. 18

5. 24

6. 30

7. 36

8. 42

9. 48

10. 54

11. 60

12. more than 60 hours; specify ....hours/year for 10 years

13. Don't know

IF THE RESPONDENT ANSWERED O HOURS/YEAR (FOR 10 YEARS) OR DON'T KNOW, ASK QUESTION 28

28. What is the most important reason why you and your household will not contribute labor to control Sargassum in your community? *(ONLY ONE REPLY OPTION IS ALLOWED)*

0. I am old and do have not the energy to work

1. I have a physical disability and cannot work.

2. My work schedule will not allow me to do this community work

3. I will be willing to pay rather than contribute labor

4. My household have no spare time for this

5. Difficult to state the number of hours

6. Other reasons (please specify); ....

29. Why are you willing to contribute labor in controlling Sargassum? *(ONLY ONE REPLY OPTION ALLOWED)*

SHOW CARD WITH REPLY OPTIONS

1. I want a preserve, a clean environment in the ocean.

2. I want to reduce the stench from the sargassum.

3. I want to increase fish catch in the community.

4. I want to see growth in my community.

5. others. please specify...

30. How realistic do you think it is that these two Sargassum control program will be implemented?

Program	Realistic/success expectation	tick
Environment tax	Very realistic	
	Somewhat realistic	
	Less realistic	
	Unrealistic	
	Do not know	
Contribution of labor	Very realistic	
	Somewhat realistic	
	Less realistic	
	Unrealistic	
	Do not know	

A5. Socio-demographic characteristics

31. Age.............................

32. Gender

0. Male

1. Female

33. What is your highest level of education

0. None

1. Primary

2. Junior high school

3. Senior high school

4. Tertiary

34. Employment status

0. unemployed

1. full-time

2. part-time

3. student

4. apprentice

5. retired/ pensionneer

35. Marital status

1. Married

2. Unmarried

3. Divorced

4. Widowed

36. Number of wives

1. one

2. two

3. three

4. four

37. Type of household head

1. Male-headed

2. Female-headed.

38. What was the total expenditure for your household the previous month?

Ans Gh¢.............../month

39. What was your savings for the previous month?

Gh¢..............per/month

Thank you for your response to this survey. We really appreciate your time and effort.

Do you have any comment you would like to add regarding this topic or the questions we have asked?

Answer: ....

B

Table 5.2.3.1 Gender Distribution of Respondents for the study

Gender	Freq.	Percent	Cum.
male	373	70.64	70.64
female	155	29.36	100.00
Total	528	100.00	

Table 5.2.3.2 Regional Distribution of Respondents for the study.

	Freq.	Percent	Cum.
central	131	24.81	24.81
western	397	75.19	100.00
Total	528	100.00	

Table 5.2.3.3Employment status of respondents for the study.

	Freq.	Percent	Cum.
unemployed	36	6.82	6.82
full time	386	73.11	79.92
Part-time	41	7.77	87.69
student	24	4.55	92.23
apprentice	26	4.92	97.16
retired/pensioner	15	2.84	100.00
Total	528	100.00	

Table 5.2.3.4 Distribution of Respondents by Education

LEVEL OF EDU	Freq.	Percent	Cum.
none	207	39.20	39.20
primary	122	23.11	62.31
junior high	98	18.56	80.87
snr high	62	11.74	92.61
tertiary	39	7.39	100.00
Total	528	100.00	

Table 5.2.3.5 Distribution of Respondents Household by their main Economic Activity.

HHA	Freq.	Percent	Cum.
unemployed	5	0.95	0.95
fishing/fish monger	423	80.11	81.06
professional job	31	5.87	86.93
student/apprentice	13	2.46	89.39
farming	9	1.70	91.10
petty trading	14	2.65	93.75
tourism	9	1.70	95.45
small business	9	1.70	97.16
artisans	15	2.84	100.00
Total	528	100.00	

Table 5.2.1 Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) AGE	1.000											
(2) EDUCATION	-0.355	1.000										
(3) ECO_ACTIVITY	-0.103	0.238	1.000									
(4) EMPLOYMENT_STA~S	-0.024	0.099	0.060	1.000								
(5) ENUMERATORS	0.121	-0.069	-0.061	-0.001	1.000							
(6) EXPENDITURE	0.227	0.057	0.081	-0.157	0.002	1.000						
(7) HHSIZE	0.305	-0.284	-0.141	0.025	0.018	0.124	1.000					
(8) HHMINORS	0.148	-0.322	-0.120	-0.033	0.025	0.064	0.722	1.000				
(9) INCOME	0.212	0.077	0.099	-0.147	-0.039	0.967	0.104	0.032	1.000			
(10) MALE	0.224	-0.023	-0.089	-0.191	0.039	0.207	0.142	0.077	0.151	1.000		
(11) SAVINGS	0.064	0.101	0.083	-0.133	-0.058	0.587	0.043	-0.033	0.774	0.132	1.000	
(12) YRS_SARG_VISI~Y	0.446	-0.141	-0.023	-0.040	0.022	0.300	0.248	0.099	0.276	0.163	0.146	1.000

Presentation of logit and probit models in tables

Logistic regression- Willingness to pay – (money)

Model 1

POSITIVE_WTP_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	.535	.271	1.97	.048	.004	1.066	**
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.609	.288	2.11	.034	.045	1.174	**
junior high	.577	.317	1.82	.068	-.044	1.197	*
snr high	.154	.433	0.36	.722	-.695	1.003	
tertiary	1.034	.642	1.61	.107	-.223	2.292	
: base unemployed	0	.	.	.	.	.	
full time	1.589	.468	3.39	.001	.671	2.507	***
part time	1.581	.576	2.74	.006	.451	2.711	***
student	1.034	.689	1.50	.133	-.316	2.383	
apprentice	1.156	.653	1.77	.077	-.124	2.436	*
retired/pensioner	.905	.801	1.13	.258	-.665	2.474	
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-.659	1.138	-0.58	.563	-2.89	1.572	
professional job	-.685	1.289	-0.53	.595	-3.212	1.842	
student/apprentice	-.777	1.293	-0.60	.548	-3.31	1.757	
farming	.023	1.38	0.02	.987	-2.682	2.727	
petty trading	-1.107	1.28	-0.87	.387	-3.615	1.401	
6o	0	.	.	.	.	.	
small business	-1.869	1.334	-1.40	.161	-4.484	.746	
artisans	-1.578	1.261	-1.25	.211	-4.05	.893	
Gender : base female	0	.	.	.	.	.	
male	.066	.268	0.25	.806	-.459	.59	
M-status : base ma~d	0	.	.	.	.	.	
unmarried	.076	.373	0.20	.839	-.654	.806	
devorced	1.145	.531	2.16	.031	.104	2.186	**
widowed	.368	.429	0.86	.39	-.472	1.208	
EFFECTIVENESS_WTP-MONEY	-2.653	.453	-5.85	0	-3.542	-1.765	***
YEARS_OF_RESIDENCE	-.023	.008	-2.89	.004	-.039	-.007	***
ENUMERATORS	-.104	.213	-0.49	.626	-.522	.314	
Constant	1.853	1.23	1.51	.132	-.559	4.264	

Mean dependent var	0.637	SD dependent var	0.481
Pseudo r-squared	0.198	Number of obs	512
Chi-square	132.683	Prob > chi2	0.000
Akaike crit. (AIC)	588.327	Bayesian crit. (BIC)	694.285

**** p<.01, ** p<.05, * p<.1*

Table 0.2 Model 2

POSITIVE_WTP	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig

_MONEY							
: base central	0	.	.	.	.	.	
western	.833	.249	3.35	.001	.345	1.321	***
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.567	.287	1.98	.048	.004	1.13	**
junior high	.557	.321	1.74	.083	-.072	1.187	*
snr high	.123	.437	0.28	.779	-.734	.98	
tertiary	.981	.641	1.53	.126	-.276	2.238	
: base unemployed	0	.	.	.	.	.	
full time	1.428	.456	3.13	.002	.535	2.321	***
part time	1.393	.566	2.46	.014	.283	2.503	**
student	.877	.688	1.28	.202	-.471	2.225	
apprentice	1.068	.641	1.67	.096	-.189	2.326	*
retired/pensioner	.241	.75	0.32	.748	-1.229	1.71	
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-.746	1.16	-0.64	.52	-3.019	1.528	
professional job	-.786	1.309	-0.60	.548	-3.351	1.78	
student/apprentice	-.917	1.304	-0.70	.482	-3.473	1.639	
farming	.113	1.4	0.08	.935	-2.631	2.858	
petty trading	-1.084	1.309	-0.83	.408	-3.65	1.483	
6o	0	.	.	.	.	.	
small business	-1.816	1.351	-1.34	.179	-4.463	.832	
artisans	-1.634	1.282	-1.27	.203	-4.147	.88	
Gender : base female	0	.	.	.	.	.	
male	.04	.266	0.15	.88	-.481	.562	
M-status : base ma~d	0	.	.	.	.	.	
unmarried	.123	.374	0.33	.742	-.611	.857	
devorced	.947	.523	1.81	.07	-.078	1.972	*
widowed	.291	.428	0.68	.497	-.548	1.13	
EFFECTIVENESS_WTP-MONEY	-2.622	.454	-5.77	0	-3.512	-1.731	***
ENUMERATORS	-.108	.212	-0.51	.611	-.524	.308	
HHSIZE	-.064	.039	-1.63	.103	-.141	.013	
Constant	1.782	1.255	1.42	.156	-.677	4.242	

Mean dependent var	0.637	SD dependent var	0.481
Pseudo r-squared	0.189	Number of obs	512
Chi-square	126.824	Prob > chi2	0.000
Akaike crit. (AIC)	594.186	Bayesian crit. (BIC)	700.144

*** *p<.01*, ** *p<.05*, * *p<.1*

Table 0.3 Model 3

POSITIVE_WTP_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	.846	.239	3.54	0	.377	1.316	***
LEVEL OF EDU :	0	.	.	.	.	.	

bas~e							
primary	.53	.283	1.87	.061	-.025	1.085	*
junior high	.499	.316	1.58	.114	-.119	1.118	
snr high	.058	.421	0.14	.891	-.768	.883	
tertiary	1.024	.549	1.86	.062	-.052	2.1	*
: base unemployed	0	.	.	.	.	.	
full time	1.334	.441	3.03	.002	.47	2.197	***
part time	1.332	.554	2.40	.016	.246	2.418	**
student	.841	.664	1.27	.205	-.461	2.143	
apprentice	1.054	.632	1.67	.095	-.184	2.292	*
retired/pensioner	.216	.736	0.29	.77	-1.228	1.659	
Gender : base female	0	.	.	.	.	.	
male	.087	.254	0.34	.733	-.411	.584	
M-status : base ma~d	0	.	.	.	.	.	
unmarried	.021	.359	0.06	.954	-.682	.723	
devorced	.901	.513	1.75	.079	-.106	1.907	*
widowed	.29	.426	0.68	.495	-.545	1.126	
EFFECTIVENESS_WTP-MONEY	-2.653	.447	-5.93	0	-3.53	-1.777	***
ENUMERATORS	-.087	.208	-0.42	.677	-.495	.322	
HHSIZE	-.058	.038	-1.51	.131	-.132	.017	
Constant	1.061	.678	1.57	.117	-.267	2.389	

Mean dependent var	0.643	SD dependent var	0.480
Pseudo r-squared	0.187	Number of obs	521
Chi-square	126.891	Prob > chi2	0.000
Akaike crit. (AIC)	588.155	Bayesian crit. (BIC)	664.759

**** p<.01, ** p<.05, * p<.1*

Table 0.4 Model 4

POSITIVE_WTP_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	.624	.291	2.14	.032	.054	1.194	**
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.623	.311	2.00	.045	.013	1.233	**
junior high	.491	.332	1.48	.139	-.16	1.142	
snr high	-.091	.456	-0.20	.843	-.984	.803	
tertiary	1.537	.846	1.82	.069	-.12	3.194	*
: base unemployed	0	.	.	.	.	.	
full time	1.942	.576	3.37	.001	.813	3.072	***
part time	1.744	.676	2.58	.01	.418	3.07	***
student	1.405	.791	1.78	.075	-.144	2.955	*
apprentice	1.575	.73	2.16	.031	.145	3.005	**
retired/pensioner	.497	.864	0.57	.566	-1.198	2.191	
EFFECTIVENES	-2.729	.542	-5.03	0	-3.792	-1.665	***

S_WTP-MONEY							
HHSIZE	-.053	.042	-1.24	.214	-.136	.03	
EXPENDITURE	0	0	0.48	.635	0	.001	
EFFECT_SARG_ COMM	-.587	.589	-1.00	.319	-1.743	.568	
Constant	.92	.816	1.13	.259	-.678	2.519	

Mean dependent var	0.689	SD dependent var	0.463
Pseudo r-squared	0.192	Number of obs	450
Chi-square	107.196	Prob > chi2	0.000
Akaike crit. (AIC)	480.792	Bayesian crit. (BIC)	542.431

*** *p<.01*, ** *p<.05*, * *p<.1*

Table 0.5 Model 5

POSITIVE_WTP _MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	.533	.266	2.00	.045	.011	1.055	**
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.577	.286	2.02	.044	.017	1.138	**
junior high	.457	.312	1.46	.144	-.155	1.068	
snr high	-.016	.412	-0.04	.969	-.825	.792	
tertiary	.882	.627	1.41	.16	-.347	2.112	
: base unemployed	0	.	.	.	.	.	
full time	1.561	.444	3.51	0	.69	2.432	***
part time	1.535	.567	2.71	.007	.424	2.647	***
student	1.02	.662	1.54	.123	-.278	2.318	
apprentice	1.191	.628	1.90	.058	-.039	2.421	*
retired/pensioner	1.014	.782	1.30	.194	-.518	2.546	
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-.69	1.087	-0.63	.526	-2.82	1.441	
professional job	-.762	1.245	-0.61	.541	-3.202	1.678	
student/apprentice	-.896	1.238	-0.72	.469	-3.323	1.53	
farming	.05	1.34	0.04	.97	-2.576	2.675	
petty trading	-1.112	1.232	-0.90	.367	-3.528	1.303	
6o	0	.	.	.	.	.	
small business	-2.025	1.281	-1.58	.114	-4.535	.486	
artisans	-1.478	1.219	-1.21	.225	-3.866	.91	
EFFECTIVENES S_WTP-MONEY	-2.637	.452	-5.84	0	-3.523	-1.752	***
HHSIZE	-.058	.039	-1.48	.138	-.134	.019	
YEARS_OF_RES IDENCE	-.02	.008	-2.50	.012	-.035	-.004	**
Constant	2.299	1.19	1.93	.053	-.032	4.631	*

Mean dependent var	0.637	SD dependent var	0.481
Pseudo r-squared	0.192	Number of obs	512
Chi-square	129.110	Prob > chi2	0.000

Akaike crit. (AIC)	583.899	Bayesian crit. (BIC)	672.904

**** p<.01, ** p<.05, * p<.1*

Logistic regressions - Willingness to pay –(time) models.

Table 0.6 Model 1

POSITIVE_WTP _TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	-.014	.352	-0.04	.968	-.705	.676	
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.454	.401	1.13	.258	-.333	1.24	
junior high	.536	.455	1.18	.24	-.357	1.428	
snr high	-.168	.519	-0.32	.747	-1.186	.85	
tertiary	-1.051	.563	-1.87	.062	-2.154	.052	*
: base unemployed	0	.	.	.	.	.	
full time	-.408	.593	-0.69	.491	-1.571	.754	
part time	.321	.802	0.40	.689	-1.25	1.893	
student	-.927	.869	-1.07	.286	-2.631	.777	
apprentice	1.461	1.441	1.01	.311	-1.363	4.285	
retired/pensioner	-2.553	.898	-2.84	.004	-4.313	-.792	***
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	.934	1.266	0.74	.461	-1.548	3.416	
professional job	-.169	1.343	-0.13	.9	-2.8	2.463	
student/apprentice	1.203	1.65	0.73	.466	-2.031	4.437	
farming	.385	1.606	0.24	.81	-2.763	3.534	
petty trading	-.297	1.434	-0.21	.836	-3.107	2.513	
tourism	-1.369	1.429	-0.96	.338	-4.17	1.432	
small business	-.804	1.477	-0.54	.586	-3.698	2.09	
artisans	-1.017	1.376	-0.74	.46	-3.714	1.681	
EFFECTIVENES S_WTP-MONEY	-.206	.361	-0.57	.568	-.914	.501	
EFFECTIVENES S_LABOUR	3.063	.382	8.02	0	2.315	3.811	***
YEARS_OF_RES IDENCE	-.024	.009	-2.58	.01	-.042	-.006	***
Constant	-.642	1.398	-0.46	.646	-3.382	2.098	

Mean dependent var	0.803	SD dependent var	0.398
Pseudo r-squared	0.307	Number of obs	519
Chi-square	158.020	Prob > chi2	0.000
Akaike crit. (AIC)	400.368	Bayesian crit. (BIC)	493.909

**** p<.01, ** p<.05, * p<.1*

Model 2

POSITIVE_WTP_TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	-.062	.364	-0.17	.866	-.775	.652	
YEARS_OF_RESIDENCE	-.007	.011	-0.66	.507	-.029	.014	
YRS_SARG_VISIBILITY	-.164	.056	-2.92	.004	-.274	-.054	***
HHMINORS	.24	.09	2.66	.008	.064	.417	***
MARITAL_STATUS	-.01	.178	-0.06	.953	-.359	.338	
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.499	.422	1.18	.237	-.328	1.325	
junior high	.642	.465	1.38	.167	-.269	1.553	
snr high	-.054	.518	-0.10	.917	-1.07	.962	
tertiary	-1.027	.584	-1.76	.079	-2.171	.117	*
: base unemployed	0	.	.	.	.	.	
full time	-.295	.615	-0.48	.631	-1.501	.911	
part time	.523	.855	0.61	.541	-1.154	2.199	
student	-.98	.88	-1.11	.265	-2.704	.745	
apprentice	1.712	1.704	1.00	.315	-1.627	5.052	
retired/pensioner	-2.895	.98	-2.95	.003	-4.816	-.974	***
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	1.439	1.285	1.12	.263	-1.079	3.957	
professional job	.4	1.365	0.29	.769	-2.275	3.076	
student/apprentice	1.584	1.653	0.96	.338	-1.656	4.823	
farming	.589	1.615	0.36	.715	-2.577	3.755	
petty trading	-.065	1.457	-0.04	.964	-2.92	2.79	
tourism	-.748	1.453	-0.51	.607	-3.597	2.1	
small business	-.044	1.491	-0.03	.976	-2.966	2.877	
artisans	-.719	1.398	-0.51	.607	-3.458	2.02	
EFFECTIVENESS_LABOUR	2.952	.402	7.34	0	2.164	3.74	***
Constant	-.876	1.434	-0.61	.541	-3.686	1.934	

Mean dependent var	0.812	SD dependent var	0.391
Pseudo r-squared	0.340	Number of obs	516
Chi-square	169.456	Prob > chi2	0.000
Akaike crit. (AIC)	377.297	Bayesian crit. (BIC)	479.203

*** *p<.01, ** p<.05, * p<.1*

Model 3

POSITIVE_WTP_TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	.124	.331	0.38	.706	-.523	.772	
YRS_SARG_VISIBILITY	-.165	.047	-3.52	0	-.257	-.073	***

HHMINORS	.238	.088	2.71	.007	.066	.409	***
M-status : base ma~d	0	.	.	.	.	.	
unmarried	-.171	.439	-0.39	.697	-1.032	.69	
devorced	.308	.828	0.37	.71	-1.314	1.93	
widowed	-.115	.569	-0.20	.84	-1.231	1.001	
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.485	.415	1.17	.242	-.328	1.298	
junior high	.513	.454	1.13	.259	-.378	1.403	
snr high	-.491	.497	-0.99	.323	-1.466	.483	
tertiary	-1.556	.48	-3.24	.001	-2.498	-.614	***
: base unemployed	0	.	.	.	.	.	
full time	-.459	.58	-0.79	.429	-1.595	.677	
part time	.284	.805	0.35	.725	-1.295	1.862	
student	-.601	.867	-0.69	.488	-2.301	1.098	
apprentice	.866	1.351	0.64	.522	-1.782	3.514	
retired/pensioner	-3.218	.951	-3.39	.001	-5.081	-1.355	***
: base 0	0	.	.	.	.	.	
1	2.799	.386	7.25	0	2.042	3.555	***
ENUMERATORS	.48	.288	1.67	.096	-.085	1.044	*
Constant	.122	.765	0.16	.873	-1.378	1.622	

Mean dependent var	0.812	SD dependent var	0.391
Pseudo r-squared	0.305	Number of obs	516
Chi-square	152.021	Prob > chi2	0.000
Akaike crit. (AIC)	382.732	Bayesian crit. (BIC)	459.162

**** p<.01, ** p<.05, * p<.1*

Model 4

POSITIVE_WTP_TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	.301	.347	0.87	.386	-.378	.98	
YRS_SARG_VISIBILITY	-.163	.051	-3.20	.001	-.263	-.063	***
HHMINORS	.22	.095	2.31	.021	.033	.406	**
M-status : base ma~d	0	.	.	.	.	.	
unmarried	-.111	.488	-0.23	.82	-1.068	.846	
devorced	.333	.856	0.39	.697	-1.345	2.011	
widowed	-.101	.588	-0.17	.863	-1.253	1.051	
ENUMERATORS	.538	.314	1.71	.086	-.077	1.153	*
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.468	.43	1.09	.276	-.375	1.312	
junior high	.666	.496	1.34	.18	-.306	1.638	
snr high	-.122	.554	-0.22	.825	-1.208	.963	
tertiary	-1.295	.544	-2.38	.017	-2.361	-.229	**
: base unemployed	0	.	.	.	.	.	

full time	-.187	.607	-0.31	.758	-1.376	1.002	
part time	.421	.831	0.51	.612	-1.208	2.05	
student	.076	1.039	0.07	.942	-1.961	2.112	
4o	0	.	.	.	.	.	
retired/pensioner	-3.203	.979	-3.27	.001	-5.121	-1.285	***
: base 0	0	.	.	.	.	.	
1	2.817	.399	7.05	0	2.034	3.599	***
efish	-1.332	.448	-2.98	.003	-2.21	-.455	***
Constant	-.069	.811	-0.09	.932	-1.658	1.521	

Mean dependent var	0.823	SD dependent var	0.382
Pseudo r-squared	0.330	Number of obs	475
Chi-square	146.219	Prob > chi2	0.000
Akaike crit. (AIC)	333.024	Bayesian crit. (BIC)	407.963

*** *p<.01, ** p<.05, * p<.1*

Model 5

POSITIVE_WTP _TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	.755	.505	1.49	.135	-.235	1.746	
YRS_SARG_VIS IBILITY	-.243	.072	-3.37	.001	-.384	-.101	***
HHMINORS	.347	.137	2.52	.012	.077	.616	**
M-status : base ma~d	0	.	.	.	.	.	
unmarried	.38	.687	0.55	.58	-.966	1.727	
devorced	-.473	1.192	-0.40	.692	-2.808	1.863	
widowed	1.356	1.11	1.22	.222	-.82	3.533	
ENUMERATOR S	.148	.435	0.34	.734	-.704	1	
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	.388	.621	0.62	.532	-.829	1.604	
junior high	.933	.691	1.35	.177	-.422	2.288	
snr high	-.754	.712	-1.06	.289	-2.15	.641	
tertiary	-1.466	.678	-2.16	.031	-2.795	-.137	**
: base unemployed	0	.	.	.	.	.	
full time	-1.688	1.704	-0.99	.322	-5.028	1.651	
part time	-1.097	1.814	-0.60	.545	-4.652	2.459	
student	-.623	2.114	-0.29	.768	-4.766	3.52	
4o	0	.	.	.	.	.	
retired/pensioner	-4.845	2.109	-2.30	.022	-8.978	-.712	**
: base 0	0	.	.	.	.	.	
1	3.151	.559	5.64	0	2.055	4.246	***
efish	-1.815	.616	-2.95	.003	-3.023	-.607	***
Linc	.608	.346	1.76	.078	-.069	1.286	*
Constant	-2.456	3.032	-0.81	.418	-8.398	3.486	

Mean dependent var	0.842	SD dependent var	0.365
Pseudo r-squared	0.400	Number of obs	311
Chi-square	108.318	Prob > chi2	0.000
Akaike crit. (AIC)	200.622	Bayesian crit. (BIC)	271.678

*** p<.01, ** p<.05, * p<.1

Linear regression for willingness to pay- (money)

Model 1

WTP_MID_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	-43.001	7.173	-5.99	0	-57.115	-28.886	***
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	-1.39	6.192	-0.22	.822	-13.574	10.793	
junior high	17.124	7.028	2.44	.015	3.294	30.954	**
snr high	-1.979	9.443	-0.21	.834	-20.56	16.602	
tertiary	5.638	10.548	0.53	.593	-15.118	26.394	
YRS_SARG_VISIBILITY	4.45	.96	4.64	0	2.561	6.339	***
: base unemployed	0	.	.	.	.	.	
full time	-7.762	14.659	-0.53	.597	-36.607	21.083	
part time	-25.378	16.282	-1.56	.12	-57.417	6.662	
student	-13.23	18.239	-0.73	.469	-49.12	22.66	
apprentice	-11.716	17.588	-0.67	.506	-46.324	22.891	
retired/pensioner	-19.579	22.717	-0.86	.389	-64.28	25.123	
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-28.841	26.202	-1.10	.272	-80.4	22.718	
professional job	-.615	27.329	-0.02	.982	-54.391	53.161	
student/apprentice	-16.237	30.048	-0.54	.589	-75.365	42.89	
farming	-8.389	31.008	-0.27	.787	-69.406	52.628	
petty trading	-11.034	29.43	-0.37	.708	-68.944	46.876	
tourism	38.653	29.555	1.31	.192	-19.503	96.809	
small business	74.632	36.788	2.03	.043	2.243	147.021	**
artisans	-42.623	29.797	-1.43	.154	-101.257	16.011	
Gender : base female	0	.	.	.	.	.	
male	6.809	5.619	1.21	.227	-4.248	17.866	
HHSIZE	.181	1.018	0.18	.859	-1.822	2.185	
M-status : base ma~d	0	.	.	.	.	.	
unmarried	-3.47	8.273	-0.42	.675	-19.751	12.81	
devorced	-4.468	10.45	-0.43	.669	-25.03	16.094	
widowed	-4.242	9.962	-0.43	.671	-23.845	15.361	
EFFECTIVENESS_WTP-MONEY	-14.109	5.182	-2.72	.007	-24.306	-3.912	***
YEARS_OF_RESIDENCE	-.537	.217	-2.47	.014	-.964	-.11	**
ENUMERATORS	-5.939	4.673	-1.27	.205	-15.134	3.256	
PRV_MIAS	-3.376	6.63	-0.51	.611	-16.422	9.669	
Constant	104.862	28.07	3.74	0	49.627	160.098	***

Mean dependent var	52.700	SD dependent var	48.641
R-squared	0.344	Number of obs	335
F-test	5.719	Prob > F	0.000
Akaike crit. (AIC)	3469.295	Bayesian crit. (BIC)	3579.905

*** p<.01, ** p<.05, * p<.1*

Model 2

WTP_MID_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	-43.291	6.869	-6.30	0	-56.807	-29.774	***
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	-1.315	6.103	-0.22	.83	-13.324	10.693	
junior high	17.499	6.787	2.58	.01	4.145	30.853	**
snr high	-2.441	8.832	-0.28	.782	-19.821	14.938	
tertiary	4.879	10.091	0.48	.629	-14.976	24.734	
YRS_SARG_VISIBILITY	4.369	.933	4.68	0	2.532	6.205	***
: base unemployed	0	.	.	.	.	.	
full time	-5.538	14.193	-0.39	.697	-33.465	22.389	
part time	-23.493	15.946	-1.47	.142	-54.868	7.883	
student	-13.195	17.74	-0.74	.458	-48.101	21.711	
apprentice	-11.298	17.04	-0.66	.508	-44.827	22.232	
retired/pensioner	-20.2	22.079	-0.91	.361	-63.643	23.243	
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-30.302	25.699	-1.18	.239	-80.868	20.264	
professional job	-1.092	26.879	-0.04	.968	-53.981	51.796	
student/apprentice	-17.563	29.414	-0.60	.551	-75.438	40.313	
farming	-8.542	30.75	-0.28	.781	-69.048	51.963	
petty trading	-12.774	28.965	-0.44	.66	-69.767	44.219	
tourism	37.398	28.915	1.29	.197	-19.496	94.292	
small business	70.381	35.014	2.01	.045	1.485	139.277	**
artisans	-43.617	29.536	-1.48	.141	-101.733	14.499	
Gender : base female	0	.	.	.	.	.	
male	7.27	5.456	1.33	.184	-3.466	18.006	
HHADULTS	.349	1.432	0.24	.808	-2.468	3.166	
EFFECTIVENESS_WTP-MONEY	-14.078	5.084	-2.77	.006	-24.081	-4.075	***
YEARS_OF_RESIDENCE	-.555	.217	-2.56	.011	-.982	-.128	**
ENUMERATORS	-6.156	4.644	-1.33	.186	-15.294	2.982	
Constant	103.4	27.454	3.77	0	49.381	157.42	***

Mean dependent var	52.700	SD dependent var	48.641
R-squared	0.342	Number of obs	335
F-test	6.714	Prob > F	0.000

Akaike crit. (AIC)	3462.052	Bayesian crit. (BIC)	3557.405

*** *p<.01, ** p<.05, * p<.1*

Model 3

WTP_MID_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	-45.432	6.953	-6.53	0	-59.115	-31.748	***
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	-2.354	6.2	-0.38	.704	-14.556	9.848	
junior high	14.518	6.745	2.15	.032	1.244	27.792	**
snr high	-5.202	8.82	-0.59	.556	-22.558	12.154	
tertiary	3.751	10.643	0.35	.725	-17.193	24.695	
YRS_SARG_VISIBILITY	4.322	.956	4.52	0	2.441	6.203	***
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-22.825	25.297	-0.90	.368	-72.606	26.957	
professional job	15.656	26.952	0.58	.562	-37.384	68.695	
student/apprentice	-9.317	29.521	-0.32	.753	-67.411	48.778	
farming	4.486	31.169	0.14	.886	-56.853	65.824	
petty trading	-.311	28.54	-0.01	.991	-56.475	55.854	
tourism	55.196	28.925	1.91	.057	-1.726	112.117	*
small business	78.615	34.238	2.30	.022	11.236	145.994	**
artisans	-40.788	29.202	-1.40	.164	-98.255	16.678	
Gender : base female	0	.	.	.	.	.	
male	10.244	5.721	1.79	.074	-1.015	21.503	*
HHADULTS	.584	1.43	0.41	.683	-2.23	3.399	
EFFECTIVENESS_WTP-MONEY	-12.232	5.241	-2.33	.02	-22.545	-1.918	**
YEARS_OF_RESIDENCE	-.641	.22	-2.92	.004	-1.074	-.208	***
ENUMERATORS	-6.242	4.767	-1.31	.191	-15.623	3.14	
EFFECT_SARG_COMM	2.51	17.546	0.14	.886	-32.02	37.04	
HOUSEHOLD_HEAD	-.586	8.694	-0.07	.946	-17.696	16.524	
Constant	89.896	28.426	3.16	.002	33.957	145.836	***

Mean dependent var	53.045	SD dependent var	49.242
R-squared	0.351	Number of obs	321
F-test	7.706	Prob > F	0.000
Akaike crit. (AIC)	3316.816	Bayesian crit. (BIC)	3399.787

*** *p<.01, ** p<.05, * p<.1*

Model 4

WTP_MID_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	

western	-45.568	6.98	-6.53	0	-59.303	-31.832	***
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	-2.281	6.231	-0.37	.715	-14.542	9.98	
junior high	14.711	6.831	2.15	.032	1.269	28.154	**
snr high	-4.589	8.903	-0.52	.607	-22.109	12.931	
tertiary	4.274	10.694	0.40	.69	-16.77	25.319	
YRS_SARG_VISIBILITY	4.329	.956	4.53	0	2.448	6.21	***
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-22.209	25.172	-0.88	.378	-71.746	27.329	
professional job	16.185	26.902	0.60	.548	-36.757	69.127	
student/apprentice	-8.947	29.498	-0.30	.762	-66.998	49.103	
farming	5.402	30.931	0.17	.861	-55.468	66.273	
petty trading	.356	28.461	0.01	.99	-55.654	56.366	
tourism	55.565	28.881	1.92	.055	-1.271	112.402	*
small business	79.564	34.125	2.33	.02	12.408	146.721	**
artisans	-40.721	29.209	-1.39	.164	-98.202	16.76	
Gender : base female	0	.	.	.	.	.	
male	10.298	5.719	1.80	.073	-.957	21.552	*
HHSIZE	.335	.954	0.35	.726	-1.542	2.212	
EFFECTIVENESS_WTP-MONEY	-12.196	5.248	-2.32	.021	-22.525	-1.868	**
YEARS_OF_RESIDENCE	-.632	.216	-2.92	.004	-1.058	-.207	***
ENUMERATORS	-6.333	4.753	-1.33	.184	-15.686	3.02	
EFFECT_SARG_COMM	2.195	17.496	0.13	.9	-32.236	36.625	
HOUSEHOLD_HEAD	-.727	8.68	-0.08	.933	-17.81	16.355	
Constant	89.177	28.553	3.12	.002	32.987	145.366	***

Mean dependent var	53.045	SD dependent var	49.242
R-squared	0.351	Number of obs	321
F-test	7.702	Prob > F	0.000
Akaike crit. (AIC)	3316.862	Bayesian crit. (BIC)	3399.834

**** p<.01, ** p<.05, * p<.1*

Model 5

WTP_MID_MONEY	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
: base central	0	.	.	.	.	.	
western	-41.692	7.351	-5.67	0	-56.162	-27.223	***
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	-2.396	6.254	-0.38	.702	-14.705	9.913	
junior high	14.881	6.874	2.16	.031	1.351	28.41	**
snr high	.252	9.31	0.03	.978	-18.072	18.576	
tertiary	-3.647	10.849	-0.34	.737	-25.001	17.707	
YRS_SARG_VIS	3.886	1.04	3.74	0	1.839	5.932	***

IBILITY							
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	-39.831	30.5	-1.31	.193	-99.862	20.2	
professional job	.684	31.779	0.02	.983	-61.864	63.232	
student/apprentice	-51.006	36.464	-1.40	.163	-122.776	20.764	
farming	-11.873	35.491	-0.33	.738	-81.729	57.983	
petty trading	-17.751	33.273	-0.53	.594	-83.24	47.738	
tourism	35.862	33.836	1.06	.29	-30.736	102.46	
small business	46.851	42.205	1.11	.268	-36.217	129.92	
artisans	-62.51	34.379	-1.82	.07	-130.176	5.157	*
Gender : base female	0	.	.	.	.	.	
male	9.01	5.483	1.64	.101	-1.783	19.802	
HHSIZE	.343	.975	0.35	.725	-1.576	2.262	
EFFECTIVENESS_TAX	-12.322	5.341	-2.31	.022	-22.835	-1.809	**
YEARS_OF_RESIDENCE	-.594	.222	-2.67	.008	-1.031	-.156	***
ENUMERATORS	-6.08	4.817	-1.26	.208	-15.561	3.401	
EFFECT_SARG_COMM	1.943	17.483	0.11	.912	-32.468	36.355	
EXPENDITURE	.008	.006	1.31	.19	-.004	.02	
Constant	101.811	30.845	3.30	.001	41.1	162.522	***

Mean dependent var	52.682	SD dependent var	48.473
R-squared	0.338	Number of obs	310
F-test	6.994	Prob > F	0.000
Akaike crit. (AIC)	3201.216	Bayesian crit. (BIC)	3283.420

**** p<.01, ** p<.05, * p<.1*

Linear models wtp- (time)

Model 1

MID_WTP_TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	5.439	2.548	2.13	.033	.428	10.45	**
junior high	5.301	2.883	1.84	.067	-.368	10.97	*
snr high	3.901	3.911	1.00	.319	-3.789	11.592	
tertiary	2.598	5.654	0.46	.646	-8.519	13.714	
YRS_SARG_VISIBILITY	.241	.406	0.59	.553	-.558	1.04	
: base unemployed	0	.	.	.	.	.	
full time	-3.095	4.422	-0.70	.484	-11.79	5.6	
part time	-1.233	5.38	-0.23	.819	-11.811	9.345	

student	-14.466	6.334	-2.28	.023	-26.92	-2.012	**
apprentice	-4.986	5.876	-0.85	.397	-16.541	6.568	
retired/pensioner	-32.624	12.25	-2.66	.008	-56.71	-8.537	***
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	4.274	10.237	0.42	.677	-15.855	24.403	
professional job	-6.359	11.326	-0.56	.575	-28.629	15.912	
student/apprentice	8.974	11.87	0.76	.45	-14.366	32.313	
farming	-2.582	13.459	-0.19	.848	-29.046	23.882	
petty trading	13.357	12.762	1.05	.296	-11.738	38.452	
tourism	27.416	13.374	2.05	.041	1.119	53.713	**
small business	15.912	13.056	1.22	.224	-9.76	41.583	
artisans	26.958	12.506	2.16	.032	2.368	51.548	**
Gender : base female	0	.	.	.	.	.	
male	5.247	2.557	2.05	.041	.219	10.276	**
HHMINORS	-.691	.572	-1.21	.228	-1.815	.433	
EFFECTIVENESS_WTP-MONEY	2.309	2.428	0.95	.342	-2.465	7.082	
YEARS_OF_RESIDENCE	.252	.082	3.06	.002	.09	.413	***
EFFECT_SARG_COMM	1.614	8.294	0.19	.846	-14.696	17.923	
HOUSEHOLD_HEAD	3.469	3.633	0.95	.34	-3.674	10.612	
efish	-6.144	7.494	-0.82	.413	-20.88	8.592	
Constant	21.005	12.094	1.74	.083	-2.775	44.785	*

Mean dependent var	38.860	SD dependent var	20.187
R-squared	0.155	Number of obs	401
F-test	2.743	Prob > F	0.000
Akaike crit. (AIC)	3531.710	Bayesian crit. (BIC)	3635.553

**** p<.01, ** p<.05, * p<.1*

Model 2

MID_WTP_TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	5.878	2.53	2.32	.021	.904	10.852	**
junior high	6.1	2.868	2.13	.034	.46	11.739	**

snr high	3.718	3.871	0.96	.337	-3.892	11.329	
tertiary	3.239	5.617	0.58	.564	-7.804	14.282	
YRS_SARG_VISIBILITY	-.132	.399	-0.33	.74	-.916	.652	
: base unemployed	0	.	.	.	.	.	
full time	-1.984	4.263	-0.47	.642	-10.364	6.397	
part time	-.224	5.252	-0.04	.966	-10.55	10.102	
student	-14.163	6.111	-2.32	.021	-26.178	-2.149	**
apprentice	-5.419	5.74	-0.94	.346	-16.704	5.865	
retired/pensioner	-29.685	12.256	-2.42	.016	-53.781	-5.589	**
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	5.004	10.277	0.49	.627	-15.203	25.21	
professional job	-7.108	11.259	-0.63	.528	-29.244	15.029	
student/apprentice	10.183	11.533	0.88	.378	-12.493	32.859	
farming	-2.904	13.03	-0.22	.824	-28.523	22.715	
petty trading	15.301	12.582	1.22	.225	-9.437	40.038	
tourism	27.603	13.454	2.05	.041	1.15	54.055	**
small business	14.406	13.04	1.10	.27	-11.231	40.043	
artisans	21.709	12.054	1.80	.072	-1.99	45.407	*
Gender : base female	0	.	.	.	.	.	
male	6.379	2.515	2.54	.012	1.433	11.324	**
HHMINORS	-.664	.569	-1.17	.244	-1.783	.455	
effect_envt_quality	3.446	2.056	1.68	.095	-.596	7.488	*
effect_water_quality	-.721	1.066	-0.68	.499	-2.816	1.374	
EFFECTIVENESS_LABOUR	-2.698	5.013	-0.54	.591	-12.554	7.157	
EFFECTIVENESS_WTP-MONEY	.908	2.398	0.38	.705	-3.807	5.624	
YEARS_OF_RESIDENCE	.258	.081	3.19	.002	.099	.417	***
HOUSEHOLD_HEAD	4.243	3.52	1.21	.229	-2.677	11.164	
Constant	23.158	13.168	1.76	.079	-2.731	49.046	*

Mean dependent var	38.739	SD dependent var	20.373

R-squared	0.163	Number of obs	415
F-test	2.896	Prob > F	0.000
Akaike crit. (AIC)	3658.891	Bayesian crit. (BIC)	3767.654

**** p<.01, ** p<.05, * p<.1*

Model 3

MID_WTP_TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	5.511	2.492	2.21	.028	.611	10.411	**
junior high	5.352	2.862	1.87	.062	-.275	10.979	*
snr high	3.325	3.866	0.86	.39	-4.275	10.925	
tertiary	2.474	5.581	0.44	.658	-8.499	13.446	
YRS_SARG_	.03	.396	0.08	.939	-.748	.809	
VISIBILITY : base unemployed	0	.	.	.	.	.	
full time	-3.123	4.25	-0.73	.463	-11.479	5.233	
part time	-.924	5.256	-0.18	.861	-11.257	9.41	
student	-15.092	6.114	-2.47	.014	-27.111	-3.072	**
apprentice	-6.349	5.74	-1.11	.269	-17.634	4.936	
retired/pensioner	-29.903	12.281	-2.43	.015	-54.049	-5.758	**
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	4.473	10.31	0.43	.665	-15.797	24.744	
professional job	-7.504	11.3	-0.66	.507	-29.72	14.713	
student/apprentice	10.449	11.579	0.90	.367	-12.315	33.213	
farming	-2.914	13.069	-0.22	.824	-28.607	22.78	
petty trading	15.281	12.625	1.21	.227	-9.54	40.103	
tourism	26.622	13.411	1.99	.048	.257	52.987	**
small business	15.729	13.073	1.20	.23	-9.972	41.43	
artisans	22.14	12.095	1.83	.068	-1.638	45.919	*
Gender : base female	0	.	.	.	.	.	
male	5.322	2.275	2.34	.02	.849	9.795	**
HHMINORS	-.665	.569	-1.17	.244	-1.784	.455	
effect_envt_quality	2.73	2.035	1.34	.181	-1.271	6.732	
effect_water_quality	-.717	1.065	-0.67	.501	-2.811	1.376	

YEARS_OF_RESIDENCE	.239	.08	2.97	.003	.081	.397	***
EFFECTIVENESS_LABOUR	-.011	4.901	-0.00	.998	-9.646	9.625	
Constant	27.753	11.873	2.34	.02	4.41	51.096	**

Mean dependent var	38.644	SD dependent var	20.392
R-squared	0.152	Number of obs	418
F-test	2.943	Prob > F	0.000
Akaike crit. (AIC)	3686.792	Bayesian crit. (BIC)	3787.679

**** p<.01, ** p<.05, * p<.1*

Model 4

MID_WTP_TIME	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LEVEL OF EDU : bas~e	0	.	.	.	.	.	
primary	5.523	2.522	2.19	.029	.565	10.481	**
junior high	5.317	2.947	1.80	.072	-.476	11.11	*
snr high	2.969	4.117	0.72	.471	-5.124	11.063	
tertiary	3.581	5.74	0.62	.533	-7.704	14.866	
YRS_SARG_VISIBILITY	.606	.35	1.73	.084	-.081	1.293	*
: base unemployed	0	.	.	.	.	.	
full time	-1.636	4.36	-0.38	.708	-10.209	6.937	
part time	.431	5.312	0.08	.935	-10.013	10.874	
student	-13.599	6.352	-2.14	.033	-26.087	-1.111	**
apprentice	-5.818	5.897	-0.99	.325	-17.412	5.777	
retired/pensioner	-27.424	12.48	-2.20	.029	-51.96	-2.888	**
HHA : base unemplo~d	0	.	.	.	.	.	
fishing/fish monger	3.791	10.444	0.36	.717	-16.742	24.323	
professional job	-8.337	11.427	-0.73	.466	-30.802	14.128	
student/apprentice	9.649	11.758	0.82	.412	-13.468	32.765	
farming	-3.993	13.252	-0.30	.763	-30.047	22.061	
petty trading	13.775	12.786	1.08	.282	-11.362	38.912	
tourism	25.073	13.541	1.85	.065	-1.549	51.695	*
small business	12.988	13.353	0.97	.331	-13.264	39.24	
artisans	19.079	12.178	1.57	.118	-4.862	43.021	
Gender : base	0	.	.	.	.	.	

female							
male	6.15	2.364	2.60	.01	1.502	10.797	***
HHMINORS	-.576	.579	-0.99	.321	-1.714	.563	
effect_envt_quality	3.57	2.073	1.72	.086	-.505	7.646	*
effect_water_quality	-1.125	1.071	-1.05	.294	-3.231	.981	
EFFECTIVENESS_LABOUR	-.769	4.941	-0.16	.876	-10.483	8.944	
M-status：base ma~d	0	.	.	.	.	.	
unmarried	1.662	3.527	0.47	.638	-5.273	8.597	
devorced	8.923	4.405	2.03	.043	.263	17.584	**
widowed	2.682	4.247	0.63	.528	-5.667	11.031	
Constant	27.037	12.059	2.24	.026	3.328	50.747	**

Mean dependent var	38.644	SD dependent var	20.392
R-squared	0.143	Number of obs	418
F-test	2.506	Prob > F	0.000
Akaike crit. (AIC)	3695.454	Bayesian crit. (BIC)	3804.412

**** p<.01, ** p<.05, * p<.1*