Journal of Industrial Engineering & Management Research
Vol.3 No.1 **DOI:** https://doi.org/10.7777/jiemar.v3i1
http://www.jiemar.org e-ISSN : 2722-8878

IMPACT OF PLASTIC BANKING IN INCOME: CASE STUDY OF THREE BARANGAYS IN NAGA CITY

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ABSTRACT

Naga City, Camarines Sur generates roughly 80 tons of garbage per day and is heavily polluted with persistent floods due to improper waste disposal. Nearing the city landfill's maximum capacity, the city's Solid Waste Management Office (SWMO) set waste management programs to efficiently manage waste. One of which is the Plastic Banking Project, a public-private partnership for waste diversion and income generation in local communities.

Plastic Bank is dedicated to stop ocean-bound plastics and reduce poverty through their recycling ecosystem. This study aims to analyze the impact of the Plastic Banking Project on its contributions to the income in the three partner barangays through the registered and unregistered plastic bank members. Multiple Regression Model is used to determine the impact of the project on being a formal register member of Plastic Bank.

This study proves that an increase in collected solid waste kilos per month increases monthly income. On the other hand it found out that labor hours and social benefit tokens had no relationship with monthly income.However in the descriptive analysis of the study, the researchers found out that the majority of the respondents state that being an active collector for the plastic banking project, impacts them through additional income and benefits and can engage more people to turnover solid waste in Plastic Bank.

Keywords: Solid Waste Management, Plastic Banking Project

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1. INTRODUCTION

Plastic bank is a for-profit social enterprise created by David Katz and Shaun Frankson in 2013. It is committed to stop ocean-bound plastic and alleviate global poverty by monetizing plastic waste, sharing its value with those who help collect it, and reintroducing it into the global supply chain. Its long-term goal through 2025 is to extract 1 billion kg of plastic annually, impact 1 billion people and be a $1 billion-dollar company. It creates environmental, social, and economic impact by creating a closed-loop economy for plastic, reducing the need for virgin plastic production. It creates environmental impact through the process of recycling, collecting, and exchanging plastic waste for tokens while rewarding, incentivizing, and empowering plastic bank members to create a social impact. It makes an environmental impact by renewing, regenerating, and unleashing ic–recycled plastics from plastic banks. Illustrated in Figure 1.

Figure 1. Plastic Bank Cycle. Retrieved from Plastic Bank PH.

Plastic Bank Memberships include a blockchain-secured digital wallet that stores virtual identity information, trust score, and credit score of members. Members and their families can become eligible for insurance, healthcare, education, and various life improvement programs through a Plastic Bank membership. The Membership Criteria cites that members must be over the age of 18 and have access to a smartphone; they are then verified by Plastic Bank operators through various methods of social validation to receive full access to the program via the Plastic Bank app. Temporary membership is given to people without access to a phone until they can

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obtain one. The Plastic Bank app allows all member types to safely transact value and access Plastic Bank membership benefits, such as life improvement programs.

Naga City, Camarines Sur is largely polluted and has a persistent problem with floods near river banks, low-lying communities, and even central business districts which resulted from improper waste disposal. (Nolasco 2019). Naga City generates about 80 tons of garbage per day which are sent to Balatas controlled dumpsite that has an area of 3.4 hectares. Upon reaching the landfill's full capacity in the next 3-5 years, the Balatas controlled dumpsite will close and use a new landfill in San Isidro with 10 hectares. The landfill in San Isidro could be a sustainable solution to the waste issues in Naga however, the new dumpsite is below the required 24 hectares of Sustainable Sanitary Landfill to Waste System (SSLTES) caused by the limited budget in solid waste management (SWM). (Tanomboon 2015). As part of the solution to the solid waste issues in Naga City, their Solid Waste Management Office (SWMO) set solid waste management programs to efficiently manage waste.

The Plastic Banking Project implemented in Naga City, Camarines Sur started in 2019. It is a public-private partnership with Plastic Bank PH as part of Naga City's recycling project initiatives for waste diversion and income generation in local communities. There are three plastic bank partner barangays in Naga City as of February 2021 namely Brgy. Caragayan, San Felipe, and Concepcion Pequeña with 75 members in total but with 49 officially registered plastic bank members only. For Phase-1 only the 49 officially registered plastic members benefited from the project.

The Plastic Bank Ecosystem in Naga City starts with the collection of plastic waste by the Plastic Bank Members. The plastic waste collected is limited to Polyethylene terephthalate (PET) bottles and "Sibak" (waste from broken plastic materials like tabo, upuan). They are then brought to a barangay level Materials Recovery Facility (MRF) which are then brought to the City-Wide MRF and later on delivered to a processor. Plastic waste from Barangays without MRF is brought to the City-Wide MRF as well. The Informal Waste Sector (IWS) then brings some of the collections from the City-Wide MRF to junk shops. From junk shops, they are then brought to aggregators and later on brought to processors. The participants of the project are the residents of partner barangays and for every kilo of recyclable plastics, they are given tokens that can be converted to necessities and even cash. Illustrated in Figure 2.

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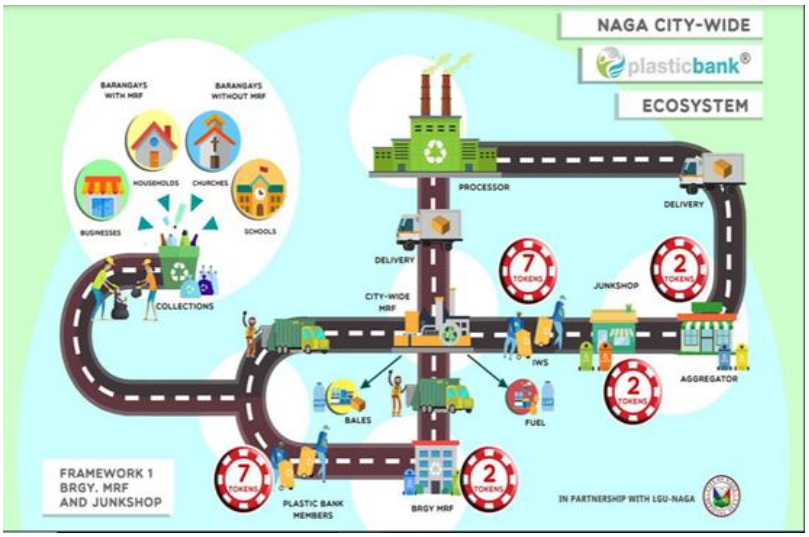

Figure 2. Naga's City-Wide Plastic Bank Ecosystem. Retrieved from Naga City's Solid Waste Management Office

This research aims to analyze the impact of the "Plastic Banking" Project on its contribution to the income in the three (3) barangays (Cararayan, San Felipe, and Concepcion Pequeña) of Naga City, Camarines Sur. The key variables investigated in this paper include solid waste per kilo, labor hours per day, memberships, cash from plastic bank, social benefits, and income. Specifically, this paper wants to answer the following; (a) Does solid waste per kilos and labor hours per day positively or negatively affect the waste pickers' income?, (b) What is the significance of social benefits of "Plastic Banking" projects to waste pickers' income?, and (c) Do social benefits converted into cash or tokens of "Plastic Banking" projects will engage more people to turnover solid waste in Plastic Bank?

This paper will be beneficial to the Solid Waste Management Office in Naga City and help them reach Phase 2 to engage more waste pickers. This can be beneficial to residents, informal waste collectors, and plastic bank members to turnover plastic waste since it can be viewed as a valuable resource through Plastic Bank's monetization efforts. It would be helpful to the constituents of Naga City to be able to understand the usage and importance of solid waste management that can encourage them to participate in SWM programs. It can be useful to other municipalities to create SWM projects similar to the plastic banking project in the efforts to increase income and divert waste. This paper may also serve as a reference to future researchers who would be tackling the same topic.

2. LITERATURE REVIEW

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2.1. A. Income and Solid Waste Management

The research of Hoornweg, D. and Thomas, L.(1999), discusses the broad trend of solid waste in Asia. Now in Asia, especially in urban areas spend about US$25 billion on solid waste management per year with a daily waste generation rate of 760,000 tonnes, but it will gradually grow to at least US$50 billion in 2025 and increase up to 1.8 million tonnes per day. Hoornweg and Thomas tackle possible policies, budget requirements, environmental effects associated with solid waste management, and escalating costs that solid waste management consumes from local government budgets and how to handle these increases. It is concluded in their paper that Asia should pursue regional approaches to many solid waste management problems and there should be a charge for every waste disposal and collection based on generation rates of municipalities. In addition, municipalities are usually responsible for solid waste management but with the magnitude of the problem facing Asia, other levels of government, businesses, and communities should participate.

The research work by Keisham, S. and Biswajit, P.(2015) examines the conditions of the current MSWM trends in India and analyzes and suggests the opportunities that exist in improving the management of MSW in many Indian cities. India is the world's second-most populous country, the level of urbanization has increased from 27.81 % in 2001 to 31.16 % in 2011. Inadequate MSW collection and improper final disposal are two of the most serious issues. Municipalities' various collection systems capture or collect fewer than half of the total garbage generated. As a result, waste is dispersed around cities, and is disposed of haphazardly in low-lying areas or open dumps, or burned in backyards. It is safe to conclude that India's MSWM system is poor. To address the issues as effectively as feasible, the countries should design area-specific solutions to local MSW management issues. Above all, we must not overlook the reality that the government is making strides toward creating good institutions and aggressive MSW policies. The best way ahead is to build on the current system's strengths while addressing its flaws.

According to the research of Nasreen, Hossain, and Kundu(2006), they attempt to address issues in poverty and sustainable development in Bangladesh with the idea of environmental protection and ecological balance. It analyzes the development scenario intending to reduce poverty in Bangladesh. In conclusion, instead of contributing to sustainability and poverty reduction most of the development strategies had a negative effect on the overall environment and society. According to the Environmental Sustainable Index 2001 Report, Bangladesh has been ranked in the 99th position. It scored 14 out of 100 countries in reducing vulnerability.

The study by Meyer(1987) and Katzman(1988) aims to explore the knowledge, attitudes, and practices (KAP) of highland residents to provide a basis for the development of waste management in the study area and management in the highland community as a whole. In the area, municipal solid waste generated up to 430,828.2 tons per year but only 43% of waste was properly managed and 24% of waste was properly disposed of. A cross-sectional study was

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conducted in Mae Fah Luang district, Thailand, from November 2016 to January 2017. A random sample of 451 respondents constituted the study population. Data were gathered using a structured questionnaire. Pearson Correlation and χ 2 were applied to identify the association among variables. The findings of this study indicated that participants' knowledge of MSW management is high, but the levels of attitude and practice are neutral and moderate, respectively. It showed a positive correlation between knowledge and practices.

Immigrants, often from the rural areas, comprise an important percentage of scavenger populations. In Cairo, for instance, most Zabbaleens are descendants of individuals who migrated from northern Egypt in the 1880s. That was also the case in the United States, where Jewish immigrants at the turn of the century made a living and prospered by collecting metal scrap for recycling using horse carts.

Waste pickers are often a vulnerable demographic and are typically women, children, the elderly, the unemployed, or migrants. Formalizing informal waste pickers could lead to improved waste collection and recycling. For instance, in Quezon City, the Philippines, approximately 3,000 waste pickers work at the Payatas landfill. They generally work in unhealthy conditions, lack social security or health insurance, are subject to fluctuations in the price of recyclable materials, lack education and training opportunities, and face strong social stigma. Because of the social stigma often associated with waste picking, political buy-in could allow for social inclusion in the solid waste sector. Governments and corporations can help waste picker cooperatives establish direct contracts with large buyers of recyclables, such as bottle manufacturers, by imposing sanctions on middlemen to ensure fair prices, directly offering waste pickers a fair and consistent wage at deposit centers, or assisting waste picker cooperatives in establishing direct contracts with large buyers of recyclables, such as bottle manufacturers. Informal workers might also benefit from formal recognition by gaining job security and recognition for their efforts. (Kaza, Yao, Bhada-Tata & Woerden 2018)

According to a study by Chiu, A.(2010), a Filipino citizen generates approximately 0.30 to 0.7 kilograms of garbage per day. In 2007, the total waste management generated nationwide was 12.15 million tons with 23.54% or around 6.8 million tons of which came from Metro Manila(MM). The estimated waste that is recycled and composted per day in Metro Manila is only 720 tons. The remaining percentage is either dumped illegally on private islands and water bodies, or burned openly, and hauled to the dumpsite. In addition, as the population increases, waste generation increases. The study aims to create a plan of implementation of ESWA and other initiatives, giving importance to the informal sector and creating opportunities in recycling household waste [Linis Ganda]. It is concluded, budget constraints of the national government did not allow for LGUs to receive enough technical and institutional support from the national government for the implementation of ESWMA. The Environmental Management Bureau only receives 7 million pesos annually to oversee the implementation of the ESWMA. The informal recycling sector has been found to significantly contribute to the higher recycling rates especially in MM. Linis Ganda provides livelihood to the underground economy, supplies raw materials to

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industries and artisans at a more affordable price, and ultimately reduces end garbage volume for disposal. There should be a high level of societal and political support because it will be a critical success factor.

The Wangwa community places the burden of segregation on a household level. Organic waste, recyclable waste, hazardous garbage, and general waste are separated into four streams by households. The town has benefited financially from the recycling of plastics and the processing of organic waste. 30,000 kg of organic waste is turned into fertilizer each month, which is sold to visitors and utilized for community tree planting and gardening. Monthly earnings from sorting and selling recyclables range from THB12,000 to THB15,000. Since the community's establishment, the Wangwa waste management system has resulted in an improvement in the community's recycling rate from zero. The community earns around THB 21,600 (USD680) each month by selling recycled items. (Sea-Circular, 2020)

According to Habitat (2010), the informal collectors may provide the recovery of 50-100% of the number of wastes generated in the cities of developing countries. By saving significant amounts of wastes from elimination through disposal, the informal activities of collection and recycling contribute to dumpsite life extension, which is translated into cost savings for the budget of the municipality.

Maharashtra, India's banned disposable products manufactured from plastic and thermocol (polystyrene). The government has played a major role by bringing the law into effect. As a result, women in self-help groups are looking at making jute or cotton bags as a major source of income. And other goods come in small paper pouches and cloth bags. Furthermore, corporations like Starbucks, Coca Cola, and Bisleri adapted and took the responsibility of collecting waste plastics from Mumbai and recycle it or up-recycle it for various uses. For this situation, people's participation can be seen as NGOs, schools, celebrities, industrialists as they have begun campaigns to beat plastic pollution. (Ministry of Housing and Urban Affairs ,2019)

Purnama (Purnama Putra, Damanhuri, and Sembiring, 2018) discovered informal sector activities (waste bank) in Yogyakarta, as well as trash banks' ability to take garbage and an increasing percentage of waste management services. They discovered that after integrating waste management with the waste bank, the percentage of waste services has grown.

The garbage bank is dominated by members of the community who are poor and low-income. It has to do with the main reason for joining the waste bank, which is to make money. Waste banks are used by those who are poor or have limited income to supplement their income (Maryati et al., 2018).

The number of garbage banks in Indonesia increased dramatically in 2018, to 5,244 units dispersed over 34 provinces and 219 regencies/cities. The garbage bank earns an average income

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of Rp. 1,484,669,825 per year and contributes 1.7 percent of national garbage reduction (1,389,522 tons/year) from national garbage generation (KLHK, 2018).

To provide some firsthand accounts of garbage and the promise it has for poverty reduction and development, suggesting that the goal of solid waste modernization should not be divorced from the protection of livelihoods. It contends that eradicating poverty entails more than just designing strategies to provide jobs and revenue. The necessity of mobilizing informal rubbish pickers as a tool for poverty alleviation is also discussed in the article. It is concluded that a paradigm shift is required to inform the upgrading of solid waste management systems to improve existing livelihoods. This is essential for the long-term viability of poverty-relief and environmental projects. According to the study, providing incentives to garbage picker organizations and recognizing the social and environmental role they play will help to create and cultivate conditions that will improve the social and economic well-being of informal garbage workers. Dias, S (2012)

In Surabaya, the waste bank is rapidly expanding, supporting community livelihoods and encouraging people's environmental self-reliance. Their goals are to look into the role of waste banks in promoting community-based environmental governance, as well as to look into how waste banks implement public involvement (community, government, and private sector) to establish effective and collaborative environmental management. Their study concluded that a reduction in the waste tonnage of up to 7,14 tons per week has been achieved. The population was 2.740.490 in 2005, and garbage transported to landfills was 1.819 m3. Until 2011, this sum had been reduced. Surabaya's number of garbage banks expanded by more than 50% between 2010 and 2012, and by 30% between 2012 and 2013. The considerable increase shows that the situation has improved. The management of trash banks should be improved further. The government should enact more regulations to protect waste bank managers and customers. (Wijayanti & Suryani, 2015).

Ho1: ***The amount of solid waste turned in by an individual has a positive relationship with income.***

H□1: ***There is no relationship between the amount of solid waste turned in and income.***

B. Income and Labor Hours

A reduction of work hours can increase productivity by reducing fatigue and permitting more leisure. However, it can also restrict laborers from having enough time to be proficient or learn a skill, therefore, leading to a reduction in Productivity (Lee & Lim, 2014).

Informal recycling as a labor strategy relies on an individual’s capacity for physical work (i.e., health, ability, and strength), as well as the availability of materials in the trash stream. Increasing competition for materials was described by many respondents as a threat to their livelihoods. Cartoneros’ work also inherently involves exposure to health threats. However, their

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labor may also offer protective health benefits because it provides people with income, exercise, and possibly a safer working environment than previous hazardous worksites (as noted by one respondent who used to work at a tannery surrounded by industrial chemicals). (Parizeau, K. 2015)

This study defines long working hours as employees working greater than 40 hours per week or 8 hours per day. Some countries define long working hours as working 50 hours a week or more, such as in Japan and South Korea, the USA (United States of America), Australia, New Zealand, and the United Kingdom (OECD, 2013).

Standard Working Hours: According to Schank (2015), standard hours refer to the specified weekly working time, determined by law, collective bargaining agreement, or individual contracts. Common terminology used besides working hours includes normal working hours, standard working hours, and the standard workweek. The general standard workweek should comprise 40 hours per week, since the International Labour Organisation (ILO) established this in 1930 (Angrave & Charlwood, 2015).

The concept of labor contribution is the total hours worked by every person engaged in production. Hours worked are defined as the hours spent on productive activities (OECD, 2018). Harrison & Scorse (2010) analyzed firm-level data to indicate that more than the doubled minimum wage was raised to pay for unskilled production workers but decreased employment. Chun & Khor (2010) use the *IFLS* and apply an estimation strategy developed by Neumark et al. (2004) which includes dummies to indicate an individual's wage distribution position. While they find positive wage and negative employment effects for individuals at the lower end of the wage distribution in the formal sector, they do not observe such effects in the informal sector.

Waste separation, composting, and recycling activities in Cebu City have aided in the creation of viable income and employment alternatives. In 2011, recycling and composting efforts in Barangay Luz created 338 new jobs for low-income residents, bringing in an additional PHP 404,500 (about US$ 8,000) every month. And according to Cebu Solid Waste Management Inc., 20-30 of its employees originally worked at the landfill and were later hired to help run the company's composting facility. The city's efforts have also aided in the improvement of working conditions for several waste pickers in the city. Cebu City's activities demonstrate the potential for decentralized composting to generate new job possibilities and income in local communities. (UN Environment-IGES ,2017)

Increased labor productivity and efficiency can also contribute to an increase in the number of employment by expanding lower-cost services, according to Schubeler et al (1996). Economic initiatives should aim to boost labor productivity and efficiency first, and then produce more income and jobs by expanding the availability of lower-cost, more efficient services. Experience in the formal and informal private sectors shows that better facilities and equipment, as well as more productive use of employees' time, can greatly boost trash workers' pay.

(Pharino and Chalcharoenwattana, 2015) The study's findings suggested that key success factors may include the synergy between curbside recycling services, community-wide

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collaboration, understanding of recycling benefits, and fair pricing of recyclables purchased at the waste bank, all of which help to sustain participation in CBM activities.

Ho2: ***The amount of labor hours spent collecting plastic waste by an individual has a positive relationship with income..***
H□2: ***There is no relationship between labor hours spent collecting plastic waste turned in and income.***

C. Income, Memberships, Cash from Plastic Bank and Social Benefits

The research of Moreno-Sanchez, R. and Maldonado, J. (2006) shows that scavengers in developing countries generate a positive externality to society (lengthening of empty landfill space and natural resources availability) and, therefore, their activity should be encouraged through economic incentives that lead them to increase the amount of solid waste recovery up to economically efficient levels. To conclude, scavenging is not only a source of income for many people facing precarious economic conditions, but it also generates a positive environmental externality on natural resource use and landfill lifespan. Informal waste-picking activities should be encouraged and successful experiences should be replicated. With the increasing trend towards privatization of services and the drive for increased efficiency, legislative frameworks and contracts should be flexible enough to allow the participation of small-scale service providers, e.g. groups of organized waste-pickers.

Khair, H.(2019) stated that waste banks offer services for converting recyclables into money in a savings system that is based on a simplified version of the formal banking system and employs temporary locations owned by individuals or organizations. In general, recyclable things collected from the community are weighed and documented in a savings book, and the item's equivalent money is reimbursed every three months or more.

The waste bank is an Indonesian waste management concept that involves the treatment of recyclable garbage and allows consumers to save money by putting their recyclable wastes in the waste bank. The garbage bank also encourages people to actively participate in environmental management. Waste banks rely on the engagement of the community in which they are located, as well as the cooperation of the recycling industry, to operate. Priyo, Sulami, Murayama, & Nishikizawa (2018).

Veolia Institute (2019) stated that Plastic Bank is working to reduce poverty while preventing ocean plastic pollution. Plastic Bank reveals the full value of waste plastic by allowing it to be exchanged for money, goods, or blockchain-secured digital tokens, making it too precious to throw away. This helps to strengthen recycling ecosystems all around the world, promoting responsible economic development in underserved regions, and lowering the amount

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of plastic entering our oceans. Plastic collected at Plastic Bank locations is recycled and marketed as Social Plastic to companies looking to make their supply chains more sustainable, environmentally friendly, and socially responsible. The value of Social Plastic extends beyond the price of plastic as a commodity: it creates a ladder of opportunity for the world's poor and protects our oceans from pollution. The Philippines is a well-developed recycling market with a plethora of rubbish stores. People can take their trash to junk shops and get paid for it. Veolia Institute is working with a junk shop cooperative that represents 150 stores to unify them, build social franchises, strengthen their business platform and viability, and provide them with a digital platform. Collectors and families in underprivileged areas benefit directly when Social Plastic is transformed into new items and purchased by everyday people. Collectors are paid a consistent living income and have access to products and services that we take for granted in industrialized countries.

Waste management costs can be decreased if the volume of waste sent to landfills is reduced. Waste bank activities benefit not only from an economic standpoint, namely the empowerment of the local economy, but also from an environmental and social standpoint (Wulandari, Hadi Utomo, & Narmaditya, 2017).

In Dar es Salaam, a discussion occurred in 2003. It discusses the importance of solid waste management, some actions, and benefits for the poor areas. It ended with the knowledge that solid waste collection and recycling provide important opportunities for job creation. Whenever possible, labor-intensive methods should be preferred and recycling should be encouraged. Community-based and private sector waste collection can provide useful alternatives to the use of municipal workforces for waste collection, but the public sector has a very important role in such partnerships.

Stefan Gabriel Burcea (2015) postulated in his research which examines the waste recycling informal activities by businesses and people which involves the extraction of recyclable waste generated in every household. It will evaluate the informal waste sector's point of view and implications from three perspectives: social, economic, and environmental. It is concluded, the existence of the informal sector has financial advantages, on the other hand, it has become a social disadvantage for informal recyclers due to the unhealthy condition of living and working environment.

According to Bertrab, A., Hernandez, J., Macht, A., and et al(2009), the private sector becomes a direct ally in developing strategies for the promotion of sustainable development, rather than just an exclusive contractor for delivering urban public services or a recipient of incentives from international development cooperation, in public-private partnerships (PPPs). The partnership, which was founded in 2006 and is now in its third phase of implementation, has proven to be a successful tool for promoting integrated solid waste management. The PPP measure benefits from a high degree of complementarity between public and private sector

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resources and know-how, as well as a multiplier effect from bringing in additional private partners.

The study by Karunarathna, A., Rajapaksha, T., Gamagedara, Y., etc.(2020) examines the foundation and evolution of plastic recycling under two operational modalities in urban areas which are single municipal operations, and Public-Private Partnership(PPP) based operations. This is analyzed based on effectiveness, technical feasibility, environmental impact, financial sustainability, and sense of ownership because of learning lessons and replicability of successful implementation in other cities. It is concluded, the recycling activity with the cooperation with the private sector and waste generators assured a stable price throughout the year. Due to the expansion of source segregation, total waste generation dropped from 150 TPD in 2015 to 130 TPD in 2017. Another achievement is the establishment of recyclables collection centers such as SWMC, SPC, SRCs in schools, and PRC as a plastic processing facility. The operational efficiency of the PRC was improved and generated a profit with the management and operations handed over to the private sector.

Godfrey Ganizani Kwantra Mvuma (2002) led the study intending to provide much-needed data and information concerning solid waste management in Lesotho. The availability of such information and data will serve the purpose of facilitating policy and guidelines on this subject, the development of appropriate integrated solid waste management systems, and creation opportunities in the country. It is concluded that there was a low level of awareness on waste management-related policy, regulatory instruments, and fragmented legal framework on waste management. In addition, the informal sector has revenue around MO.7 million per annum from waste recycling-related activities and generated about 282 job opportunities. Another benefit of solid waste management is biomass energy which is used for cooking and heating. However, it created adverse impacts. Also, waste pickers expressed that their job affected their health negatively. It suggested that the government should act and intervene in formalizing waste harvesting activities in Lesotho.

An empirical research was conducted in Columbia regarding the understanding of the causal relationship between poverty reduction and climate change mitigation through the analysis of a cash transfer program aimed at poverty reduction. To measure the relationship, a multiple regression analysis was done using the national and municipal data. It is concluded that poverty reduction and climate change mitigation has positive relationships (Malerba, 2020).

Monirozzaman et al (2011) synthesized the benefits, for the local authorities, obtained from the existence of informal waste collection activities: create new jobs, reduce the number of stored wastes, extend the life of waste landfills, preserve primary resources and energy, reduce the pollution caused by waste, etc. Regardless of whether it is performed by formal or informal means, recycling helps the community to advance" towards the top of the waste management hierarchy (Asim et al, 2012).

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The study by the World Bank Group (2021) stated that the private sector focused market assessment of plastics value chains and the recycling market in the Philippines, with the overall goal of identifying the opportunities and barriers for plastics circularity in the country. The focus is on the recycling aspect of the circular economy for plastics, as a lever to divert plastic wastes away from landfills and the open environment and to increase the re-introduction of plastics.

Upgrading the informal sector is reasonable to diversify poor people's income. Our data showed that scrap buyers can earn USD 126 per month (about 78% of the average income in Mekong Delta even though they are old and low educated. Then, scrap trading is a livelihood opportunity for the poor. If the government places more concern over this sector, the opportunity of livelihoods from scrap trading can be seen as a more sustainable strategy of poverty alleviation (Tong, Hyunh, & Khong 2021).

The study coordinated by WIEGO (2014), supposed the quantitative and qualitative research of the complex issue of informal recycling activities, analyzing the opinion of 763 informal collectors coming from 5 cities of Africa, Asia, and Southern America. Within this study, the main categories of economic benefits of informal waste recyclers have been identified. One of the benefits refers to the fact that the informal activity leads to the earning of basic incomes, which are necessary to provide the subsistence of informal collectors households and families; the same aspect was identified by Rockson et al (2013).

According to Gunsilius, Chaturvedi, and Schein berg (2011), there are also other categories of persons that obtain benefits from informal recyclers; the wastes collected by informal activities are capitalized through intermediates, who earn consistent profits from the difference between the price they offer to informal recyclers for the collected waste and the rate they charge to formal recyclers for the traded waste.

The generation of garbage, as well as the collection, processing, transportation, and disposal of garbage - the waste management process - is critical for public health, as well as aesthetic and environmental reasons. Due to increased economic activity and growing urbanization, municipal solid waste management has become a serious issue. Garbage pickers, who sift through the rubbish to extract salable waste, are believed to recycle 59 percent of Delhi's waste. It's not a glamorous, clean, or financially rewarding existence, but for about 1% of the population, it's all they have. They serve a public service while attempting to make a meager income. Kumor, R.(2012)

rePATRN aspires to have a positive impact on the environment, the economy, and society. The removal and processing of PET bottles has a significant environmental benefit. The ultimate goal of rePATRN is to build the capability to recycle PET plastic in large quantities while utilizing the informal sector. rePATRN has demonstrated that its network of informal garbage pickers can gather enormous volumes of plastic five years after its inception, to the point where the business had to advise collectors to slow down. After demonstrating that building PET recycling systems in Ghana would be both relevant and profitable – given the high demand. Provencal, J.(2020)

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Wulandari, D., Utomo, S., and Narmaditya, B.(2017) explains the waste management model using a trash bank and shows how this approach helps households improve their welfare. The findings show that not only is trash bank management helpful to the environment, but it also has an impact on the local economy by raising the income of housewives in the waste bank's vicinity. The community expected the government to provide more assistance in improving the waste bank's process and developing a better trash pricing model. The Malang Waste Bank has an impact on the community as well as BSM consumers. Through the suggested management paradigm, customers connect with BSM in a reciprocal relationship management and community empowerment. The added revenue from the waste and the clean environment have an impact on the community and customers. The public income has increased as a result of BSM community economic empowerment projects. Although it has not yet totally lifted them out of poverty, the BSM program continues to be followed by the neighboring communities since it has a positive influence on both themselves and the environment.

While Nzeadibe and Chukwuedozie (2011) agree that the average incomes earned by the informal collectors may be significantly bigger than the minimum incomes guaranteed in any social security system. For 65% of the respondents of their research, the incomes earned from the informal waste collection and valorization are the main source of income, with more than one-quarter of the questioned informal recyclers not earning any other income.

Genda et al. (2015) highlights the correlation between the number of hours worked per employee and productivity output is synchronized with output fluctuations in several countries. In the manufacturing industry, the number of hours worked between blue-collar and white-collar employees can differ.

Ho3: ***The membership has a positive relationship with income.***
H□3: ***There is no relationship between being a member and income.***

Ho4: ***The cash from plastic bank has a positive relationship with income.***
H□4: ***There is no relationship between the cash from plastic bank and income.***

Ho5: ***The value of plastic waste as social benefits per token has a positive relationship with income.***
H□5: ***There is no relationship between the value of the social benefits per token and income.***

2.1 SYNTHESIS

For general discussion, this paper analyzed the effects of solid waste kilo per month, labor hours per month, membership, cash from Plastic Bank and social benefits to the income of Plastic Bank waste pickers in Naga City, Camarines Sur. The variables and their corresponding

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hypothesis were based and derived from the studies and findings of other researchers, respectively.

2.2 RESEARCH SIMULACRUM

A. THEORETICAL FRAMEWORK

The research framework used in this study was derived from those developed by the World Bank Group (2021) for it is the most appropriate for Naga City, Camarines Sur, Philippine-setting. Aside from the literature review, economic theories also support the prepositions presented in this paper.

The relationship between income, memberships, cash from Plastic Bank and social benefits as our independent variables can essentially be explained by Mankiw (2013) tackles Ten Principles of Economics in his book "The Principle of Economics". And our study will focus on principle four which is "People Respond to Incentives" where people make decisions by comparing cost and benefits, their behavior may change when costs or benefits change. That is, people respond to incentives. And according to some economists when analyzing any policy, we must consider not only the direct effects but also the indirect effects that work through incentives. And if policy changes incentives, it will cause people to alter their behavior. This paper hypothesizes that social benefits which are converted into tokens and can be exchanged for cash etc. are positively related to income.

On the other hand, the effect of labor hours on the wage rate can be supported by Backward Bending Labor Force, a labor economic theory that can explain the relationship between substitution effect and income effect. But in this study the researchers will just focus on the Substitution Effect, which indicates the change in the desired hours of work resulting from a change in the wage rate, keeping income constant. And the basic theory of economic choice implies that an individual will purchase less of any normal good when it becomes relatively more expensive. In brief, the higher price of leisure prompts one to consume less leisure or, in other words, to work more. The substitution effect merely tells us that when wage rates rise and leisure becomes more expensive, it is sensible to substitute work for leisure. For a wage increase, the substitution effect makes the person want to work more hours (McConnell, Brue, & Macpherson 2016). This information, depending on the work hours level attained by the waste pickers, can affect the income level or social benefits that they can get from the "Plastic Banking" project. This paper hypothesized that labor hours and income are positively related. As Labor Economics suggests, for a wage increase, the substitution effect makes the person want to work more hours since they need to work hard to earn more money because they are in informal sectors of the economy.

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B. CONCEPTUAL FRAMEWORK

All the aforementioned economic journals and analysis will serve as study guides and main references to help the researcher lead an inquiry and an examination as to how:

(i) Solid waste kilo per month;
(ii) Labor Hours per month;
(iii) Membership;
(vi) Cash from Plastic Bank and
(v) Social Benefits from Plastic Bank

In Naga City, Camarines Sur recycling project which is “Plastic Banking” will increase formal registration. And with that, the authors of this economic manuscript plan to test the hypotheses that establish linkages between the explanatory variables and the formal registration as shown in Figure 3.

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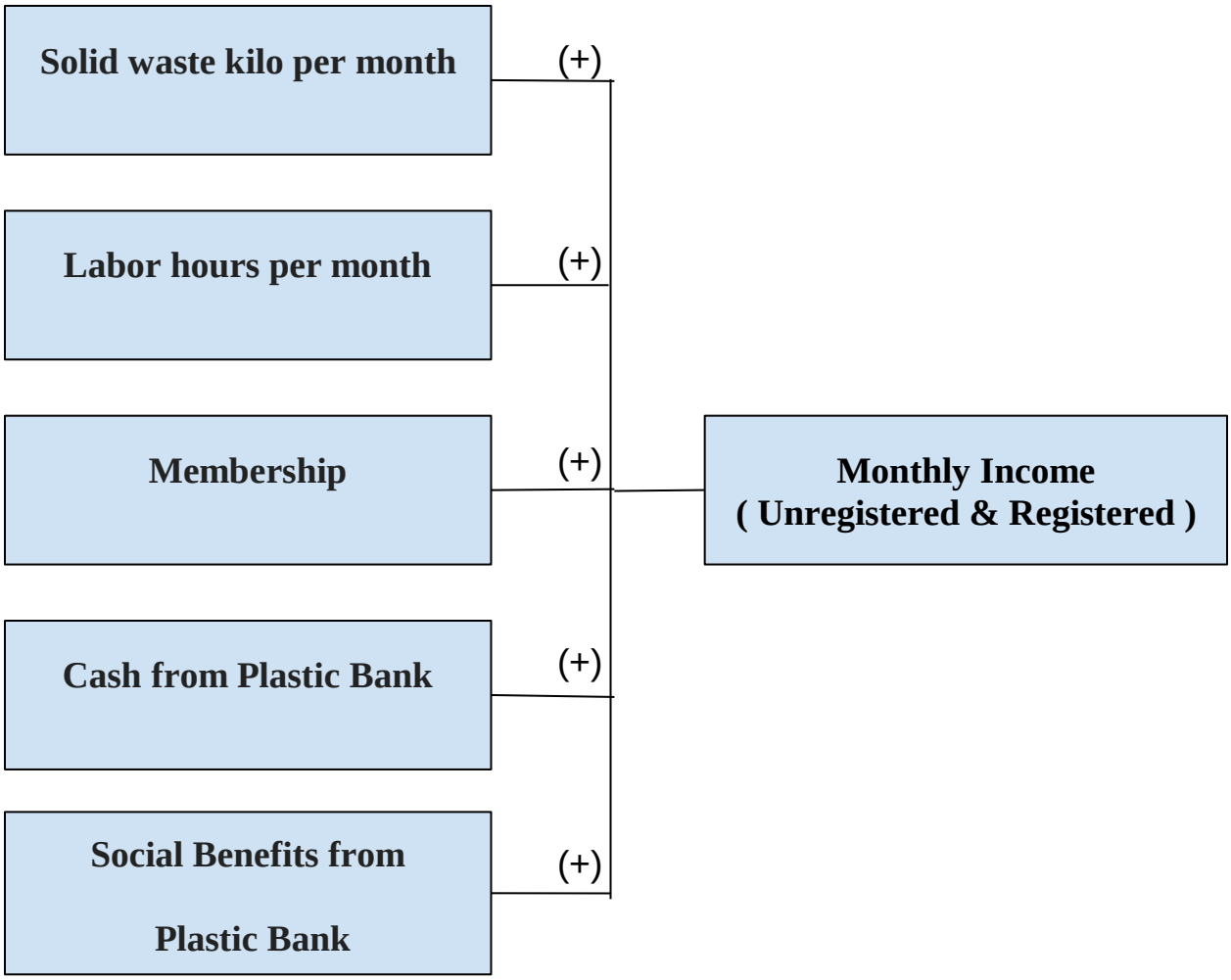

Figure 3: *Conceptual Framework*

Hypotheses:

Ho1: *The amount of solid waste turned in by an individual has a positive relationship with income.*

H□1: *There is no relationship between the amount of solid waste turned in and income.*

Ho2: *The amount of labor hours spent collecting plastic waste by an individual has a positive relationship with income.*

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H□2: *There is no relationship between labor hours spent collecting plastic waste turned in and income.*

Ho3: *The membership has a positive relationship with income.*
H□3: *There is no relationship between being a member and income.*

Ho4: *The cash from plastic bank has a positive relationship with income.*
H□4: *There is no relationship between the cash from plastic bank and income.*

Ho5: *The value of plastic waste as social benefits per token has a positive relationship with income.*
H□5: *There is no relationship between the value of the social benefits per token and income.*

3. RESEARCH METHOD

This research will survey forty-nine (49) individual registered members of Plastic Banking Project waste pickers who are the beneficiaries of the project led by the Solid Waste Management Office of Naga City, Camarines Sur. These individuals were the members of Plastic Banking in the first face of the program. The respondents in the study were chosen based on registered members of the Plastic Bank and living within the area of Naga City. Another forty-nine (49) individuals will be part of the survey which are the people who are not registered members but turned in and interested to deposit plastic waste to Plastic Bank. A total of ninety-eight (98) respondents consisted of both registered and non-registered individuals residing in Naga City.

This study will utilize a descriptive cross-sectional analysis. This method is appropriate to this study since it aims to know the impacts of the independent variables: (1) Solid waste kilo per month, (2) Labor hours per month, (3) membership, (4) cash from plastic bank, and (5) Social Benefit into tokens. This study shows the relationship of the variables in an attempt to know the interrelationship of solid waste management project which is “Plastic Banking” project to the income of being a formal registration. And if the cash and social benefits can engage more people to bring more solid waste and to increase their labor hours to have more tokens.

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3.1 TREATMENT OF DATA OR ECONOMETRIC MODEL

This research will utilize a multiple regression model to test the hypothesis and to prove if there is a relationship between the independent variables and the monthly income which is our dependent variable for the study.

The Multiple Regression Model is:

$$M\_Y = Y (SW, LH, M, CPB, SB)$$

$$M\_Y_i = B_0 + \beta_{1sw} + \beta_{2LH} + \beta_{3M} + \beta_{4CPB} + \beta_{5SB} + \mu_i$$

where:

M_Y= Monthly Income
SW= Solid Waste kilo per month
LH= Labor Hours per month in collecting plastic
M= Membership
CPB= Cash from Plastic Bank
SB= Social Benefits into form of token converted in any kind of benefits
μ= error term

The multiple regression model was used to estimate the impact of independent variables on plastic waste pickers' behavior regarding if they are registered or unregistered members of Plastic Bank Project waste pickers. And also to predict probabilities of change in behavior under several simulated variables if "Plastic Banking" projects will engage more people to turnover solid waste in Plastic Bank. And for both econometric models, descriptive statistics as data treatment for demographics and other variables, Software for Statistics and Data Science or also known as "Stata" was used to analyze data.

3.2 INSTRUMENTATION

The outline of the survey questionnaire is quite simple. The survey form and interview method were outlined in a very clear and concise manner to prevent conflicts among respondents. Official members of Plastic Bank Philippines waste pickers who were able to participate in this paper were given enough time to respond to the questions to avoid mistakes and imprecisions in their answers. The researchers used these types of questions to obtain relevant and important information in relation to the study. Where in solid waste per kilo we can get the data in numbers 2 and 3. And for labor hours we can get the data in numbers 4, 5 and 6. For memberships we can get the data in number 1. And for cash from the plastic bank, we can get the data in number 7 and 8. Lastly for social benefits, we can get the data in numbers 16 and 17. And for our dependent variable which is income we can get the data in number 14 and 15. And also, we would like to take this opportunity to help them with their recycling projects and to be the first researchers to have a study related to the recycling projects of Naga City, Camarines Sur. The respondents' cooperation with the help of the Solid Waste Management Office of Naga

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City, Camarines Sur were highly appreciated, and were guaranteed that the data gathered from them would be treated with confidentiality.

3.3 SURVEY QUESTIONNAIRE

Mahal na Respondente, Maalab na pagbati! Kami ay mag-aaral ng Kursong Ekonomiks sa Unibersidad ng Santo Tomas na kasalukuyang kumukuha at nagsusulat ng pamanahong papel hinggil sa benepisyo ng proyektong "Plastic Banking" at epekto nito sa kita ng mga opisyal na miyembro na nangangalakal ng basura kapalit ng pera o "token" .

Kaugnay nito inihanda namin ang talatanungan na ito upang makapangalap ng mga datos na kailangan sa aming pananaliksik. Kung gayon, maaaring sagutin ng may katapatan ang mga sumusunod na aytem. Tinitiyak po namin ang impormasyong iyong maibabahagi ay mananatiling konfidensial, Marami pong salamat!.

-Mananaliksik

PANUTO: Punan ang angkop na impormasyon ng mga sumusunod na katanungan. Kung may pagpipilian, lagyan ng tsek ang kahon na tumutugma sa iyong sagot

1. Pangalan (opsyonal):_____
2. Edad: _____
3. Kasali ka ba sa rehistradong miyembro ng aktibong kobrador o “active collector” ng plastik sa “Plastic Banking Project” ?
   * Kung **OO** ang iyong sagot sa **bilang 3** , **Huwag** sagutan ang **bilang 12**
   * Kung **HINDI** ang iyong sagot sa **bilang 3** , **Huwag** sagutan ang **bilang 11**
4. Ilan **kilo** ng plastik **kada araw** ang iyong nakukuha sa pangongolekta ng plastik?_____

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5. Ilan **kilo** ng plastik **kada linggo** ang iyong nakukuha sa pangongolekta ng plastik?_____

6. Ilang **oras** ang iyong ginugugol **kada araw** sa pagkuha ng plastik?_____

7. Ilang **oras** ang iyong ginugugol **kada linggo** sa pagkuha ng plastik?_____

8. Ilang beses sa **isang linggo** ka nangongolekta ng plastik?
9. Magkano ang kapalit na **pera o "token"** ang iyong nakukuha **kada araw** sa "Plastic Banking Project"? ₱_____

10. Magkano ang kapalit na **pera o "token"** ang iyong nakukuha **kada linggo** sa "Plastic Banking Project"? ₱_____

11. **Bukod sa pagiging rehistradong aktibong kobrador** o "active collector" o "waste picker" ng plastik sa "Plastic Banking Project" may **iba ka pa bang trabaho**?

12. **Bukod sa pakikilahok** at **hindi ka rehistradong "waste picker"** sa "Plastic Banking Project" may **iba ka pa bang trabaho**?

13. Kung **Oo** ang iyong sagot ilang oras ang ginugugol mo para sa iyong ibang trabaho **kada araw**?_____

14. Kung **Oo** ang iyong sagot ilang oras ang ginugugol mo para sa iyong ibang trabaho **kada linggo**?_____

15. Kung **Oo** ang iyong sagot ilang beses ka nagtatrabaho **kada isang linggo**?_____

16. Magkano ang iyong **"household income"** o kita **kada linggo**?_____

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17. Magkano ang iyong **"household income"** o kita **kada buwan**?_____

18. Sa iyong palagay, **malaki ba ang epekto** ng pagiging **rehistradong miyembro** ng aktibong kobrador o "active collector" sa "Plastic Banking Project"?

19. Bakit? Ano pa ang **ibang benepisyo** ang iyong natatanggap mula sa pagiging rehistradong miyembro ng aktibong kobrador o "active collector" sa "Plastic Banking Project"?

_____
_____
_____
_____

MARAMI PONG SALAMAT SA IYONG PAKIKILAHOK SA AMING PAGSISIYASAT!!!

3.4 SURVEY CONSENT FORM

Ako si _____ ay kusa at sumasang-ayon para makipag partisipasyon sa pananaliksik na ang pamagat ay "THE IMPACT OF PLASTIC BANKING PROJECT (PHASE I) IN THE INCOME OF THE THREE BARANGAYS IN NAGA CITY" at gamitin ang mga datos na aking ibinigay para sa ikakabuti ng pananaliksik na ito.

Ang aking partisipasyon ay kusang-loob. Ang saliksik ay na paliwanag sa akin ng maayos at malinaw, at lahat ng aking katanungan ukol sa mga tanong sa talatanungan ay nasagot ng maayos.

_____ _____
Lagda ng Kalahok Petsa

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4. RESULTS & DISCUSSIONS

4.1 DEMOGRAPHICS & DESCRIPTIVE STATISTICS

Table 1 shows the sociodemographic characteristics of the n=98 respondents who live in the barangays within NAga City.. Majority of the respondents are between 40-50 years old, corresponding to 31.63% of the total respondents. On the other hand, the least are 62 years old and above, corresponding to only 7.14% of the total respondents. The average age is 39.74 or 40 years old, with standard deviation of 12.997 or 13 years old.

Table 1. *AGE FREQUENCY AND PERCENTAGE*

Age	Freq.	Percent
18-28	23	23.47
29-39	25	25.51

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40-50	31	31.63
51-61	12	12.24
62 and above	7	7.14
Total	**98**	**100**
Mean	**39.74**	**12.997**

Table 2 shows that the average solid waste collected per day is 5.94 kilos, with a standard deviation of 6.07 kilos. On the other hand, the average solid waste kilo per week is 25.06 kilos, with a standard deviation of 31.76 kilos. The respondents have an average of 5.18 work days in a week when they spend time collecting plastic waste, with a standard deviation of 2.19 work days a week. The respondents spend an average of 5.34 hours per day in collecting plastic waste, with a standard deviation of 3.33 hours per day. The respondents spend an average of 29.15 hours per week in collecting plastic waste, with a standard deviation of 25.35 hours per week. According to Godfrey Ganizani Kwantra Mvuma (2002), the informal sector created 282 jobs.

In the respondent's other work aside from collecting plastic waste, they have an average of 4.82 work days, with a standard deviation of 2.13 days a week. They spend an average of 7.12 hours per day, with a standard deviation of 3.57 hours per day in their other job. On the other hand, they spend an average of 37.73 hours per week, with a standard deviation of 28.78 hours per week in their other jobs. The respondents earn an average weekly income of 1770.43 pesos, with a standard deviation of 1245.87 pesos. On the other hand, their monthly income has an average of 6208.06 pesos, with a standard deviation of 4254.76 pesos.

Table 2. *MEAN AND STANDARD DEVIATION OF THE VARIABLES*

Variables	**Mean**	**Standard Deviation**
Kilo per day	5.94	6.07
Kilo per week	25.06	31.76
Days of work	5.18	2.19
Hours per day	5.34	3.33
Hours per week	29.15	25.35
Hours in other work per day	7.12	3.57
Hours in other work per week	37.73	28.78
Days in other work	4.82	2.13
Weekly Income	1770.43	1245.87

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Monthly Income	6208.0 6	4254.76

Table 3 shows the respondents' nature of work where the majority of the respondents' jobs are garbage segregators, corresponding to 42.86% of the total respondents. Housewives / Househusbands correspond to 20.41% of the total respondents. Barangay employees correspond to 6.12% of the total respondents, which is the same as the number of respondents who are Helpers and Construction Workers. 5.12% of the respondents did not indicate their job description which may be due to unemployment. 3.06% are store online sellers while 2.04% are store owners the same as the number of plastic cleaners/collectors. The least of the respondents work as an electrician, a fruit vendor, a hotel housekeeper, a farmer, a networker and a street cleaner which corresponds to 1.02% of the respondents that would total in 6.12% of the respondent's jobs. According to Kaza, Yao, Bhada-Tata & Woerden 2018, Governments and businesses can assist waste picker cooperatives in securing direct contracts with large recyclers. They can impose sanctions on middlemen to ensure fair prices or directly pay a fair and consistent wage to rubbish pickers. Formal recognition may also assist informal workers by providing job stability and acknowledgement for their efforts.

Table 3. *OTHER WORK FREQUENCY AND PERCENTAGE*

Other work	**Freq.**	**Percent**
garbage segregator	42	42.86
housewife/husehusband	20	20.41
Barangay employee	6	6.12
helper	6	6.12
construction worker	6	6.12
no response / none	5	5.1
online selling	3	3.06
store owner	2	2.04
plastic cleaner / collector	2	2.04
electrician	1	1.02

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fruit vendor	1	1.02
housekeeping in hotel	1	1.02
farmer	1	1.02
net working	1	1.02
street cleaner	1	1.02
Total	**98**	**100**

Table 4 shows the effects of being an active collector or a registered member of the plastic banking project.The majority of the respondents state that being an active collector for the plastic banking project, impacts them through additional income and the benefits they receive which corresponds to 72.45% of the total respondents.And according to (Maryati et al., 2018) The waste bank is dominated by low-income and underprivileged members of the community. It has to do with the primary motivation for joining the garbage bank: to generate money. Those with little income or who require additional income to augment their income use waste banks. 15.3% of the respondent's state that aside from income and incentives, the plastic banking projects also help the environment. Monirozzaman et al (2011) summarized the advantages of informal waste collection activities for local governments, including the creation of new jobs, the reduction of stored wastes, the extension of the life of waste landfills, the preservation of primary resources and energy, and the reduction of waste pollution. Recycling, whether done formally or informally, aids the community in moving up the waste management hierarchy (Asim et al, 2012).

Table 4. *EFFECTS OF PLASTIC BANKING FREQUENCY AND PERCENTAGE*

Effects of plastic banking	**Freq.**	**Percent**
Additional Income and benefits	71	72.45
additional income and many incentives, help environment	15	15.3
additional income	6	6.12
benefits	5	5.1

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increase knowledge about segregation	1	1.02
Total	**98**	**100**

On the other hand, 6.12% of the respondent's state that the plastic banking project only impacts them as it provides additional income while 5.1% of the respondent's state that this project only impacts them from the benefits they receive. And 1.02% of the respondent's state that the project impacts them as it increases knowledge about segregation. Moreno-research, Sanchez's R. Scavengers in developing countries generate a positive externality for society (extending landfill space and increasing natural resource availability), according to Maldonado, J. (2006). As a result, their activity should be encouraged through economic incentives that encourage them to increase solid waste recovery to economically efficient levels. To summarize, scavenging is not only a source of money for many people who are struggling financially, but it also has a beneficial environmental externality in terms of natural resource consumption and landfill lifespan.

Table 5 shows the number of benefits that the respondents receive from the plastic bank where according to Veolia Institute (2019) the plastic bank shows the true value of waste plastic by allowing it to be exchanged for money, goods, or blockchain-secured digital tokens, making it much too valuable to be discarded. And with our data it can be either 0 to a mix of 5 items such as starter kits, pandemic kits, garbage strollers, tablets, rice, groceries, and cash benefits for this period. The majority of the respondents who received 0-2 items were non-members and those who received 3 or more items were mostly registered members. The majority of the respondents received 1 item only which corresponds to 27.55% of the total respondents. On the other hand, 24.49% of the respondents received no benefits at all. While only 18.37% of the respondents received a mix of 2 items of the benefits the plastic bank gives. 15.31% of the respondents were given a mix of 3 items of the benefits. 10.2% of the respondents were given a mix of 4 items of the benefits. And only 4.08% of the respondents received a mix of 5 benefits, which is the most benefits they received from plastic bank for this period. Providing incentives to garbage picker organizations and acknowledging the social and environmental role they play, according to Dias, S (2012), will help to establish and cultivate conditions that will promote the social and economic well-being of informal waste workers.

Table 5. *BENEFITS FROM PLASTIC BANK FREQUENCY AND PERCENTAGE*

Benefits from plastic	Freq.	Percent
0	24	24.49

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1	27	27.55
2	18	18.37
3	15	15.31
4	10	10.2
5	4	4.08
Total	**98**	**100**

4.2 ECONOMETRICS

Result from the first run of regression:

Note: The variables kilopermonth, and hourspermonth are computed based on the kilos of plastic per day and hours of work per day to make it consistent with the monthly income.

The **table 6** shows that the model is significant since the Prob > F value is 0.0000 which is less than 0.05 level of significance. However, the R-squared value is just 0.4840. This implies that the model can explain only 48.40% of the variation of the income. This is below the 0.70 threshold. It further implies that although the model is significant, it can only explain a very small variation of the monthly income. Looking at the p-values, there is only one independent variable which is found to be a significant predictor of the monthly income: the kilos of plastic per month. This means that the amount of plastic collected per month has a positive effect on monthly income. For every kilo of plastic collected, the monthly income increases by Php 28.45 on the average. According to Stefan Gabriel Burcea (2015), the existence of the informal sector provides financial benefits. The main areas of economic benefits of informal trash recyclers have been identified, according to a study coordinated by WIEGO (2014). One of the advantages is that informal activity leads to the generation of basic incomes, which are important for the survival of informal collectors' households and families; Rockson et al. highlighted the same aspect (2013).

Table 6. *RESULTS FROM FIRST RUN OF REGRESSION*

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Source	SS	df	MS	Number of obs	=	46
				F(5, 40)	=	7.50
Model	418309026	5	83661805.2	Prob > F	=	0.0000
Residual	446004757	40	11150118.9	R-squared	=	0.4840
				Adj R-squared	=	0.4195
Total	864313783	45	19206972.9	Root MSE	=	3339.2

monthly_income	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
kilopermonth	28.44953	7.103673	4.00	0.000	14.09247	42.80658
hourspermonth	-10.68641	11.83923	-0.90	0.372	-34.61438	13.24156
membership	-1160.067	2346.129	-0.49	0.624	-5901.77	3581.636
cashfromplasticbank	2.380558	3.142194	0.76	0.453	-3.970054	8.731169
benefitsfromplasticbanking	605.1199	717.6078	0.84	0.404	-845.2196	2055.459
_cons	2438.384	1295.598	1.88	0.067	-180.1181	5056.885

Since the model above has only one significant factor, another regression was done using only 3 factors as independent variables: the kilos per month, hours of work per month and the membership.

The result below shows that the model is significant (Prob.>F=0.0000). However, the R-squared is lower than the previous model (0.4245). This implies that only 42.45% of the variation of monthly income was explained by the model. The remaining 57.55% can be due to other factors not included in the study.

The table also shows that the variable kilos per month is a significant predictor with p-value of 0.00. The membership is significant at 0.10 level (p-value:0.086). The hours per month is not significant (0.977). The constant is significant (0.004).

Table 7 *Regression Equation:*

*monthly income = 18.83091 * (kilopermonth) + 1498.356 * (membership) + 2579.907 (constant)*

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Table 7. RESULTS FROM SECOND RUN OF REGRESSION

Source	SS	df	MS	Number of obs	=	72
				F(3, 68)	=	16.72
Model	545670425	3	181890142	Prob > F	=	0.0000
Residual	739638103	68	10877030.9	R-squared	=	0.4245
				Adj R-squared	=	0.3992
Total	1.2853e+09	71	18102937	Root MSE	=	3298

monthly_inc~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
kilopermonth	18.83091	4.35955	4.32	0.000	10.13156	27.53026
hourspermonth	-.2345679	7.999911	-0.03	0.977	-16.19814	15.72901
membership	1498.356	859.1921	1.74	0.086	-216.1353	3212.847
_cons	2579.907	861.5941	2.99	0.004	860.6222	4299.191

Interpretation:

For kilo of plastic collected per month:

For every kilo of plastic collected per month, the monthly income increases by Php18.83 on the average, holding the other variable constant.

For membership:

The members tend to have a higher income by Php 1498.356 on the average as compared to those who are not members. According to Nzeadibe and Chukwuedozie, the average revenues collected by informal collectors may be significantly more than the minimum wages promised by any social security system (2011). For 65 percent of the respondents in their survey, money from informal waste collection and valorization is their main source of income, with more than a quarter of those polled stating it is their sole source of income.

Heteroscedasticity Test

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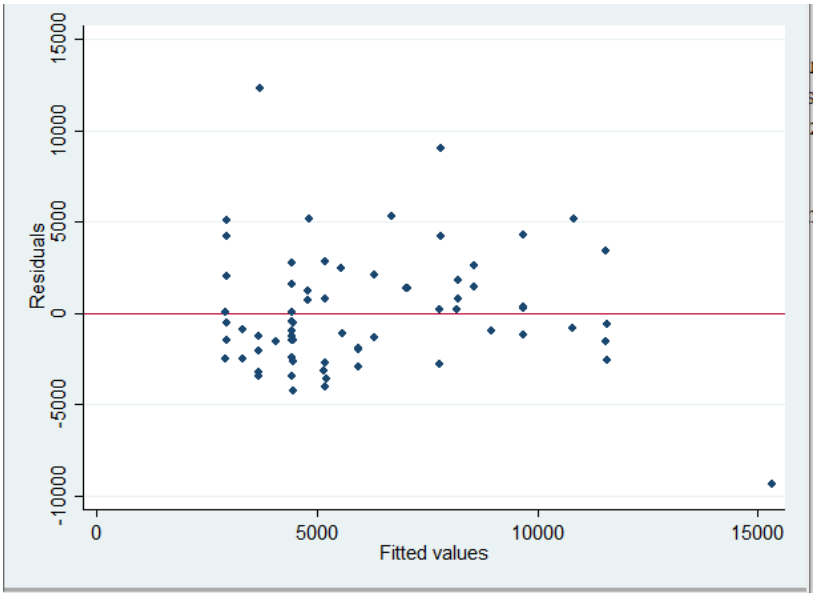
The **graph 1** shows that the p-value of the test is 0.2104, which is greater than 0.05. This means that heteroscedasticity is not present in the data. This also implies that the variance is constant and unrelated.

Graph 1. *HETEROSKEDASTICITY TEST*




```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of monthly_income

         chi2(1)      =     1.57
         Prob > chi2  =   0.2104
```

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Vol.3 No.1 DOI: https://doi.org/10.7777/jiemar.v3i1
http://www.jiemar.org e-ISSN : 2722-8878

5. SUMMARY AND CONCLUSIONS

5.1 Summary

This research aims to determine the effectiveness of the "Plastic Banking" Project Phase I on its contribution to income, in relation to solid waste per kilo, labor hours, cash from plastic bank and social benefits in Naga City, Camarines Sur. This study used primary data from an interview and survey facilitated on forty-nine (49) registered members of the Plastic Bank and forty-nine (49) unregistered members that turned in plastic waste to Plastic Bank, which makes ninety-eight (98) respondents in total.

This study utilized a multiple regression model to test the relationship between Monthly Income as the Dependent Variable with the Independent Variables: Solid Waste Kilo per month, Labor Hours per month in collecting plastic waste, Membership, Cash from Plastic Bank, Social Benefits in the form of tokens converted in any kind of benefits. Software for Statistics and Data Science or "Stata" was used to analyze the econometric models and descriptive statistics.

The majority of our respondents are between the ages of 40-50 years old and work as garbage segregators that earn an average of 1770.43 pesos in 37.73 hours in a workweek. In collecting plastic waste, the respondents spend an average of 29.15 hours per week and turn in an average of 25.06 kilos a week to the plastic bank. The majority of the respondents received at least 1 of the benefits that the plastic bank hands out such as starter kits, pandemic kits, garbage strollers, tablets, rice, groceries, and cash benefits. The majority corresponding to 72.45% of the respondents state that being an active collector / registered member for the plastic banking project impacts them through the additional income and benefits that they receive.

The model is significant since the Prob>F value is 0.0000 which is less than 0.05 level of significance. However, the R-squared value is just 0.4840. This implies that the model can explain only 48.40% of the variation of the income. This is below the 0.70 threshold. It further implies that although the model is significant, it can only explain a very small variation of the monthly income.The only independent variable that is found to be a significant predictor of monthly income is the solid waste kilo per month with a p-value of 0.00. In relation to monthly income, solid waste per kilo per month shows a positive relationship as monthly income increases for kilo of plastic waste collected. Members tend to have a higher income by 1498.356 on average compared to those who are not members; the membership is significant at 0.10 level (p-value:0.086). The hours per month is not significant (0.977). The constant is significant (0.004). And on the second run of regression where we correlated the independent variables and dependent variable it shows that the model is significant (Prob.>F=0.0000). However, the R-

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squared is lower than the previous model (0.4245). This implies that only 42.45% of the variation of monthly income was explained by the model. The remaining 57.55% can be due to other factors not included in the study.

5.2 Conclusions

The researchers aimed to analyze the impact of Plastic Bank project (Phase 1) in income, a case study of three barangays in Naga city which are barangay (Cararayan, San Felipe, and Concepcion Pequeña). The effects of each variable specifically for solid waste kilo per month , cash from Plastic Bank and membership has a positive effect on waste pickers' monthly income who are registered as compared to those who are not registered. While the other independent variables are parallel to what the researchers have hypothesized. In other words, there is no significant relationship between labor hours spent in collecting plastic waste and social benefits in income. This might be due to the small number of respondents and maybe due to other factors that are not included in the study. But in the descriptive analysis, the researchers found out that the majority of the respondents state that being an active collector for the plastic banking project, impacts them through additional income and benefits. Where social benefits converted into tokens of "Plastic Banking" projects can engage more people to turnover solid waste in Plastic Bank.

5.3 Policy Implications

The Plastic Banking Project helps to solve the socio-economic issue in the rapid increase of solid waste by converting plastic wastes into "Social Plastic" - recycled plastics, which also created opportunities for individuals utilizing the Plastic Banking Project. According to the researchers, the research findings support the notion that the Plastic Banking Project is beneficial as it is shown to have a positive relationship with the amount of solid waste and the monthly income of both the member and non-member individuals of Plastic bank. The research findings can also contribute to Mankiw (2013) "Individuals Responds to Incentives" in his book on Ten Principles of Economics since the respondents positively responded to the project. Regardless as to whether they were either members or non-members of Plastic Bank they turned in their plastic wastes in exchange for money.

This research supports the Republic Act (RA) Number 9003 of 2000, the Ecological Solid Waste Management Act of 2000 (ESWMA) through the conformity of the Naga City LGU (Camarines Sur) in its implementation. However, the Naga City LGU(Camarines Sur), a First Class municipality implementing RA 9003 of 2000 through the mandate of the Local Government Code seems insufficient due to lack of budgetary funds allocated for this kind of project as it is not a priority. The private-public partnership between Plastic Bank and Naga City LGU is advantageous as it is beneficial to their in waste diversion efforts and the constituents of the partner barangays. This study confirms the effectiveness of the Plastic Banking Project

highlighting the impact of the increase of income through the Solid waste collection and its membership. It is recommended that Plastic Banking Phase 2 should widen its coverage and involve more barangays as the study finds it effective. In the event that Plastic Bank withdraws from Naga City, the researchers propose the institutionalization of the Plastic Banking Project to the Naga City LGU (Camarines Sur) through a municipal ordinance to secure its prioritization, its budgetary requirement and its implementation up to the barangay level. With the intention to have the same effect as Malang Waste Bank's increased revenue from garbage disposal and the cleaner environment benefit the community and customers that alleviates poverty (Wulandari, Utomo, and Narmaditya 2017).

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Journal of Industrial Engineering & Management Research
Vol.3 No.1 **DOI:** https://doi.org/10.7777/jiemar.v3i1
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