Contextualizing Poverty along with the Sustainable Development Goals (SDG's) 3, 6 and 9 as non-income indicators in Ocampo, Camarines Sur Philippines: Evidences from CBMS 2019

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***Abstract*: Measuring poverty using non-income indicators enable countries to target and develop programs for poverty alleviation and understand its performance towards the sustainable development goals (SDG's). This paper which seeks to evaluate the performance of the municipality of Ocampo in Camarines Sur, Philippines towards the SDG's via the Community-based Management System (CBMS) would enable policymakers to target recipients of government programs and interventions in the municipality. This paper looked into the responsiveness of the municipality of Ocampo, Camarines Sur to the SDGs by identifying the household poverty index; poverty gap index and poverty severity index as well as estimating the probability of households in Ocampo, Camarines Sur to becoming poor using non-income indicators which are connected with the SDG's. Employing the Foster-Greer-Thorbecke (FGT) poverty measures, and logistic regression, the researcher found that around 64.5% of the households in the municipality of Ocampo, Camarines Sur are poor. Likewise, majority of the poor households in the municipality don't have access to clean and safe water, toilet facilities and internet and electric connectivity. However, despite them being poor, the residents of Ocampo visits medical facilities and received medical treatments if they are sick. The municipality does well in SDG 3, good health and well-being. To further strengthen the municipality's responsiveness to the SDG's, there is a need to strengthen barangay health units, develop local water sources and further access to internet connectivity.**

***Keywords:* CBMS, Development, Poverty, SDG's, Well-being**

I. INTRODUCTION

The Philippines is considered a newly industrialized country (Mitsumori, 2018). That is, the country is now transitioning from agriculture to service and manufacturing. This also means that the Filipino people are now having greater access to utilities and the number of poor in the country are decreasing (Takashi, 2013). However, majority of Filipinos living in rural are still poor (Andriesse, 2018). These rural Filipino settlements often result to their deprivations on various utilities (Angeles, et. al, 2019).

With majority of Filipinos still being considered poor with respect to the citizens of its neighboring countries (Raquiza, 2013), the government has been doing its best to alleviate the hardships being experienced by the citizens (Conchada, & Rivera, 2013). In coming up with these programs, the government has relied on available data. So throughout the years, economists has strived to develop a system of gathering relevant poverty data for their analyses, and the Community-Based Management System (CBMS) is one of it. The CBMS data generated locally will become a basis of targeting households in the planning, budgeting and implementation of government programs geared towards poverty alleviation and economic development (Philippine Statistics Authority, 2013).

The municipality of Ocampo, in the province of Camarines Sur, Philippines is among the hundreds of LGU's across the country which has actively collected, processed and stored their census data for CBMS. Ocampo is a third-class municipality in Camarines Sur situated Northeast of Pili, the capital municipality of the province. It has a total land area of 118 square kilometers and a population of 45,934 residents. The land area of the town constitutes 2.15% of Camarines Sur's total land area and its population represents 2.35% of the total population of the province. In the annual Cities and Municipalities Competitive Index conducted by the National Competitiveness Council of the Philippines, from a total of 1,488 municipalities across the country, it ranked 594th in Economic Dynamism, 512th in Government Efficiency, 293rd in Infrastructure, and 541st in Resiliency (Department of Trade and Industry, 2020).

Aside from the CBMS, the municipality of Ocampo is also in support of the sustainable development goals (SDG's). The SDG's can be traced in the various available variables in the CBMS. Examples of which are Medical treatment of the sick and Medical facility visited for SDG 3, Good health and well-being; Main source of water supply and toilet facility for SDG 6: Clean water and sanitation, and; Availability of Electricity in dwelling place and Access to internet for SDG 9, Industry, Innovation and Infrastructure, and many more. These variables could be used to identify the responsiveness of specific municipalities towards the SDG's. And so, aside from just using the CBMS data as non-income indicators which is helpful in identifying whether a household is poor or non-poor

or whether they should receive aid from the government or not or it, it could also be a determinant on how a municipality performs with respect to the SDGs. In retrospect, knowing the municipalities response towards the SDGs would enable one to see whether it is continually developing or not.

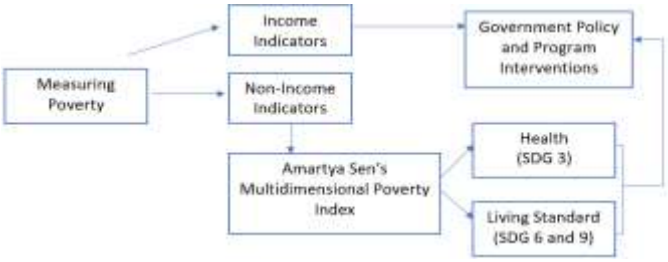
In a world perspective, countries which are able to satisfy their SDG's are generally highly-developed (Jabbari, et al, 2020). The SDG 3 for example, has been used by policymakers in setting national agenda to improve public health (Seidman, 2017). Improving public health provides economic benefits to countries (Kostyak, et. al, 2017). The SDG 3 responses however, are not only done through in person programs for improving public health, but via digital health tools as well (Asi & Williams, 2018). Public health on the other hand, wouldn't be holistic if the public does not have access to clean water and sanitation (Hasan, et. al, 2019). Likewise, since water is an integral part of human and ecosystem needs, the achievement of the SDG's is dependent on water (Mulligan, et. al, 2020). Finally, the SDG 9 is also essential in achieving economic growth. It is likewise linked to other SDG goals like SDG 8 (Tomaselli, et. al, 2019). In a technologically advancing world, technological infrastructure provides positive impacts to development in rural areas (Silver & Johnson, 2018). Eliminating digital divides and promoting digital transformation also helps in national development (Gong, 2020). But internet connectivity would have a basic prerequisite- electric connectivity.

Research Objectives:

This paper has determined the SDG responsiveness of the municipality of Ocampo, Camarines Sur which specifically aimed to:

1. identify the household poverty index; poverty gap index and poverty severity index of the municipality of Ocampo, Camarines Sur;
2. estimate the probability of households in Ocampo, Camarines Sur to becoming poor using non-income indicators namely:
   - 2.1. medical treatment of the sick;
   - 2.2. medical facility visited;
   - 2.3. main source of water supply;
   - 2.4. toilet facility;
   - 2.5. availability of electricity in dwelling place; and
   - 2.6. access to internet; and
3. analyze the performance of the municipality of Ocampo along the Sustainable Development Goals (SDG's).

Theoretical Framework:



Poverty is both complex and multi-dimensional. Forster (2010) suggests that there is no single approach which could measure poverty. Foster (2007) argued that there are alternative methods which could be effectively employed to measure poverty using both income and non-income indicators. Using the two indicators enabled them to provide insights on the well-being dynamics of poverty.

In the pioneering works of Amartya Sen, the persistence of poverty could be analyzed from a non-income point of view. This has been the inspiration on how modern economists like McKenzie (2007) and Bertolini (2019) were able to look at non-income indicators and argue that poverty could transcend from income to social exclusion. This could be utilized to capture the multidimensionality of poverty.

Looking at the responsiveness of the municipality of Ocampo, Camarines Sur on the SDG's and the probability of them becoming poor based on non-income indicators, this study is supported by the theory of Amartya Sen on the multidimensionality of poverty, specifically on the dimensions of health and living standards.

II. METHOD

This study utilized Community-Based Management System (CBMS) 2019 data of Ocampo Camarines Sur. The data will be analyzed using the Logistic Regression method using Stata to measure the relationship between the total household income and the non-income variables which are anchored on the SDG's namely: Medical treatment of the sick and Medical facility visited for SDG 3, Good health and well-being; Main source of water supply and toilet facility for SDG 6: Clean water and sanitation, and; Availability of Electricity in dwelling place and Access to internet for SDG 9, Industry, Innovation and Infrastructure. This will allow the researcher to predict the likelihood of the household being non-income parameters poor during the year 2019.

In determining the factors contributing to the likelihood of a household being classified as below poverty threshold (poor), a logistic regression model was adopted from Julien I.E. Hoffman (2019). Hoofman (2019) utilized a dummy for the independent variable: 1 for households below the poverty threshold (poor) and zero for households categorized as (non-poor). For the independent variables, six categorical/nominal data were used to explain the independent variable and estimate the extent on the probability that a household would be poor depending on the medical treatment of the sick, medical facility visited, main source of water supply, toilet facility, clean water and sanitation, availability of electricity in dwelling place and access to internet.

The researcher utilized two econometric models in this study. In identifying the poverty household count, poverty gap index and the poverty severity index was based on the Foster-Greer-Thorbecke (FGT) poverty measures:

Poverty Household Count $P_0 = \frac{N_p}{N}$

Where: N_p = Number of poor households
N = Total number of households

Poverty Gap Index $P_1 = \frac{1}{N}\sum_{i=1}^{N}\frac{G_i}{z}$ $G_i = (z - y_i) \times I(y_i<z)$

Where: G_i= Poverty gap
Z = Poverty line
y_i=actual income of the poor

Poverty Severity Index $P_2 = \frac{1}{N}\sum_{i=1}^{N}(\frac{G_i}{z})^2$

For logistic regression:

$$P = \frac{1}{1+e^{-(\beta_0+\beta_1 X_1+\beta_2 X_2+\ldots.\beta_n X_n)}} = \frac{1}{1+e^{-(\beta_0+\sum \beta_i X_i)}}.$$

Where:

P= Y = Predicted probability of household being non-income indicator poor
β_o = Y intercept
$\beta_1 X_1$ = medical treatment of the sick
$\beta_2 X_2$ = medical facility visited
$\beta_3 X_3$ = main source of water supply
$\beta_4 X_4$ = toilet facility
$\beta_5 X_5$ = availability of electricity in dwelling place
$\beta_6 X_6$ = access to internet

Table 1. Description of Variables Used in the Model

Variables		Description
Dependent Variable	PovTresh	Poverty Threshold
Independent Variables	MedTreat	Medical Treatment for the sick
	MedFacility	Medical Facility Visited
	Water	Main Source of Water Supply
	Toilet	Toilet Facility
	Electricity	Availability of electricity in dwelling place
	Internet	Access to internet

III. RESULTS AND DISCUSSION

Sustainable Development Goal 1: No Poverty

Table 2. Households' Poverty index (P_0), Poverty gap index (P_1) and the Poverty Severity index (P_2).

Number of Household	Poverty Household count	Poverty Gap Ratio	Poverty Gap Index	Poverty Severity Index
8,945	5,766	64. 46%	37.03%	26.46%

Source: Author's computation using Foster-Greer-Thorbecke (FGT) poverty measures

Table 2 presents the Household poverty Index, poverty gap index and poverty severity index in the municipality of Ocampo, Camarines Sur Philippines using the Foster-Greer-Thorbecke (FGT) poverty measures. From a total of 8,945 households, 5,766 households in the municipality has a monthly income which is below the 2019 poverty threshold of Php 9,452.00. This represents that 64.46% of the households in the municipality are poor. Likewise, the Municipality's Poverty Gap index is 37.03 % and the Poverty Severity Index is 26.46%. Like the majority of Filipinos which are considered poor (Raquiza, 2013), the majority of the households in Ocampo are also considered poor.

Sustainable Development Goal 3: Good health and well-being

Figure 1: Graph showing the Predictive Margins of the Medical Treatment of Sick

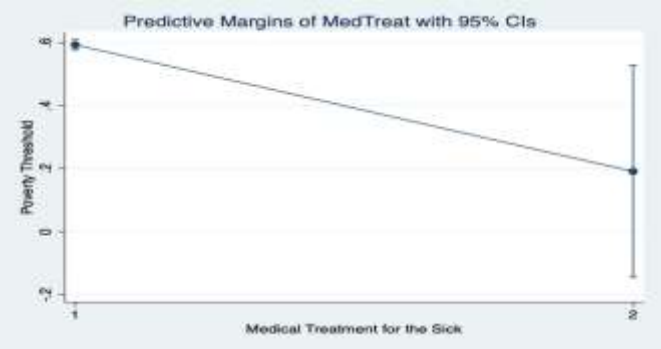


Figure 1 shows the predictive margins of the medical treatment of sick in Ocampo, Camarines Sur as non-income indicator in predicting poverty. From the logistic regression and marginal computation (See appendix, Tables 1 and 2), it shows that the households who availed medical treatment during the past 12 months in 2019 has a 60% probability of living below the poverty threshold. On the other hand, the households who did not avail any medical treatment has a 19% probability of being poor. Generally, people who avail medical treatment often are poor as health is an indicator of person with a good well-being (Seidman, 2017).

Figure 2: Graph showing the Predictive Margins of the Medical Facility Visited (if sick)

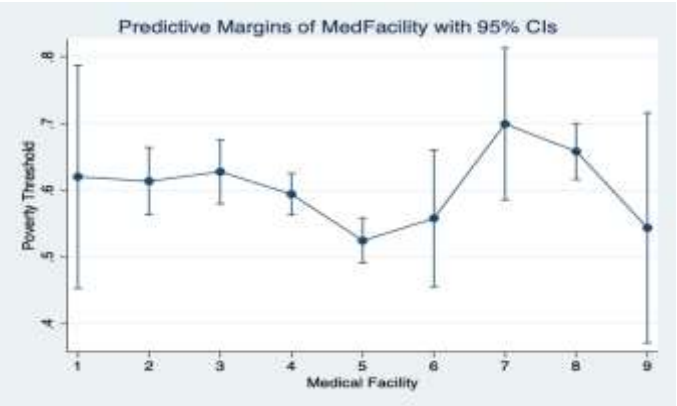


Figure 2 shows the predictive margins of the medical facility visited (if sick) of households in Ocampo, Camarines Sur as non-income indicator in predicting poverty. From the logistic regression and marginal computation (See appendix, Tables 1 and 3), it shows that the households who visited the barangay health station has the highest probability of being poor with 70% probability, while those who visit private hospital and clinic when sick only has a probability of 52% to live below the poverty threshold.

For those who are sick who visited the national public hospital, the probability of living below the poverty threshold is 62%. The 61% probability goes to those who visited the provincial public hospital and 63% for those who visited the municipal/city public hospital. On the other hand, those who visited the district public hospital has a 59% probability of being poor, while those who visited the rural health units has a 56% probability of being poor.

Finally, those who visited non-medical/non-trained hilot/personnel has a 66% probability of living below the poverty threshold while those who prefer to avail and visit other facilities has a 54% probability of being poor.

Same with the previous finding, the poor are the ones who generally visit healthcare facilities as income disparities cause disparities in health (Price, et. al, 2018), and the poor needed healthcare more than those who are above the poverty threshold.

Sustainable Development Goal 6: Clean Water and Sanitation

Figure 3: Graph showing the Predictive Margins of the main source of water supply

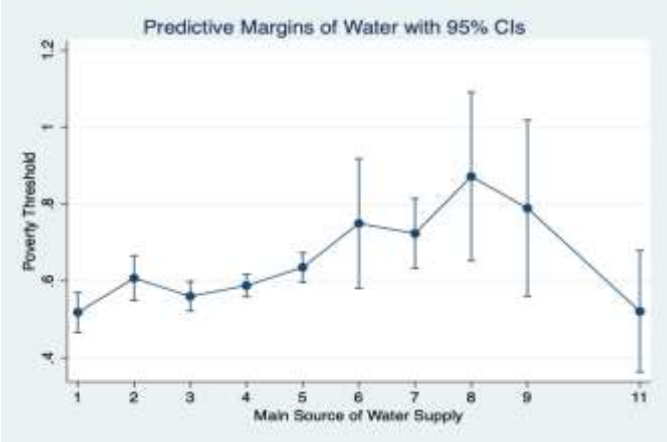


Figure 3 shows the predictive margins of the main source of water supply of households in Ocampo, Camarines Sur as non-income indicator in predicting poverty. From the logistic regression and marginal computation (See appendix, Tables 1 and 4), it shows that the households who get their water from unprotected spring has a 79% probability of living below the poverty threshold, whereas those who have their own use faucet or who are availing of the community water system like Maynilad and those who use bottled water (purified, distilled and mineral only has a 52% probability of being poor.

Meanwhile, those households who are getting their water from lake, river or rain has a 79% probability of living below the poverty threshold, 75% for those who have dug well (balon), 72% for those who get their water from protected spring, 64% for those who get their water from tubed/piped shallow well (poso, artesian well, etc.), 61% for those who use shared faucet, community water system, 59% for those who use shared tubed/piped deep well and 56% for those who use their own tubed/piped deep well. Padda & Hameed (2018), argued that those who are living in poverty endure lack of pure drinking water and access to quality drinking water.

Figure 4: Graph showing the Predictive Margins of the Toilet Facility

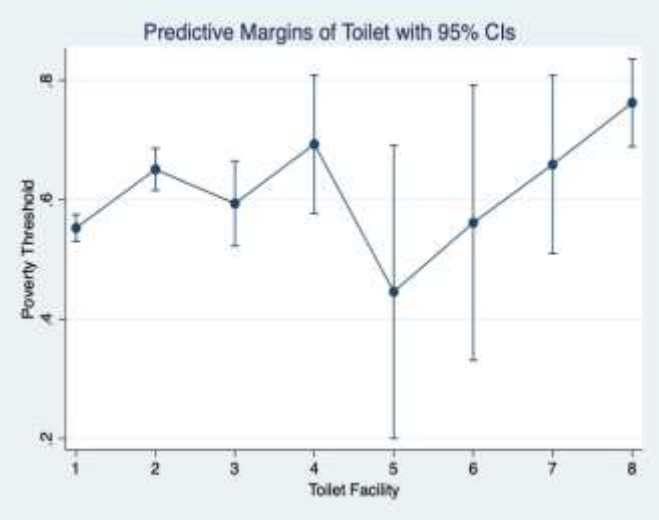


Figure 4 presents the predictive margins of the toilet facility of households in Ocampo, Camarines Sur as non-income indicator in predicting poverty. From the logistic regression and marginal computation (See appendix, Tables 1 and 5), it shows that the households who has a closed pit toilet facility only has a 45% probability of living below the poverty threshold, whereas those who do not have any toilet facility (those who utilize bodies of water, backyard, public spaces as their toilet) has the highest probability of being poor at 76%.

Following closed pit toilet facility with the lowest percentage of probability of household living below the poverty threshold are households with water-sealed, sewer septic tank, used exclusively by household with a 55% probability; those who use open pit toilets with 56% probability and those who use water-sealed, other depository, used exclusively by household with 59% probability of living poor.

On the other hand, those households who have the higher probability of living above the poverty thresholds are those who use water-sealed, sewer septic tank, shared with other household toilets with 65% probability, those who use the pail system with 66% probability, and those who use water-sealed, other depository, shared with other household with 69% probability of being poor. Aside from access to clean drinking water, people living in poverty also endure lack of sanitary facilities (Padda & Hameed, 2018).

Sustainable Development Goal 9: Industry, Innovation and Infrastructure

Figure 5: Graph showing the Predictive Margins for Electricity

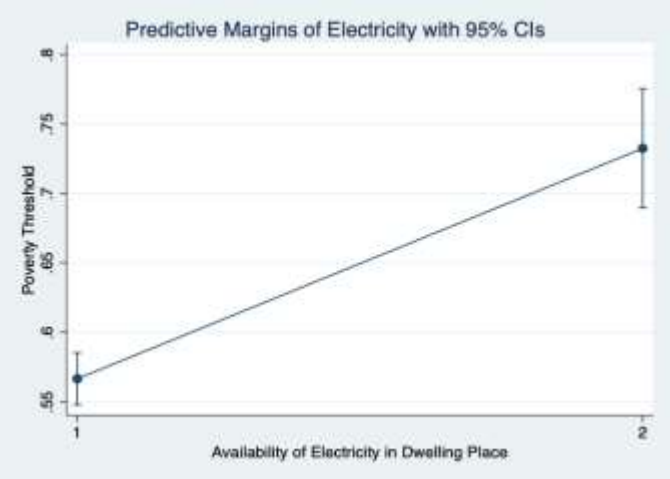


Figure 5 presents the predictive margins of the availability of electricity in dwelling place of households in Ocampo, Camarines Sur as non-income indicator in predicting poverty. From the logistic regression and marginal computation (See appendix, Tables 1 and 6), it shows that the households who have electricity in their households only have a 57% probability of living below the poverty threshold, whereas those who do not have electricity have a 73% probability of being poor. The lack of access to electricity is considered being energy poor and is called energy poverty (Son & Yoon, 2020).

Figure 6: Graph showing the Predictive Margins for Access to Internet

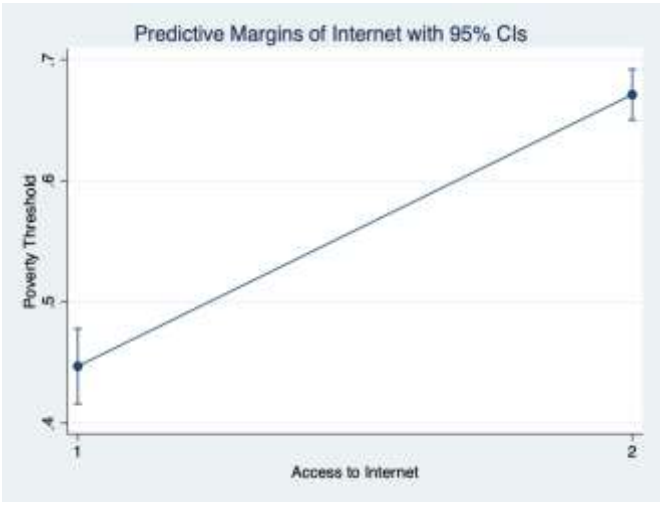


Figure 6 presents the predictive margins of the access to internet of households in Ocampo, Camarines Sur as non-income indicator in predicting poverty. From the logistic regression and marginal computation (See appendix, Tables 1 and 7), it shows that the households who have internet in their households only have a 45% probability of living below the poverty threshold, whereas those who do not have internet have a 67% probability of being poor. Disparities in internet connectivity for households with lower level of income is imminent (Stelitano, et. al, 2020). Commonly, poor households do not have access to internet.

IV. CONCLUSIONS

Following the large number of households in the municipality of Ocampo, Camarines Sur which lies below the poverty threshold, it is imperative to say that the majority of the households in Ocampo are poor. The poverty gap index likewise indicate that the poorest of the poor in the municipality is living further below the poverty threshold (Huang, et. al, 2018). Finally, the poverty severity index also shows how inequality also persists in the poor households. The large number of the poverty severity index of the municipality indicates also that even in poor households, wide inequality is also observable, and a large number of poor households have larger deprivations than another (Muñoz, et. al, 2018). With this, the municipality of Ocampo, Camarines Sur is not faring well with respect to the SDG 1 which is No Poverty.

For SDG 3, the higher probability of people availing medical treatment to belong to those which are living below the poverty threshold in the municipality of Ocampo, Camarines Sur shows that the poorer the people, the sickly they are as they are the ones who are needing more medical treatment when feeling sick (Goswami & Manna, 2013). This probability indicates a healthcare challenge for the municipality. However, despite the lower probability of the people "who aren't availing any medical treatment when they are sick" to be poor, but still this do not indicate that those people living above the poverty threshold in Ocampo do not need any medical treatment when sick at all.

On the other hand, the larger the number of people availing the health services provided by the country, the better as this indicates a strong healthcare (Dufresne, et. al, 2014). However, in the case of the municipality of Ocampo, Camarines Sur, the households who live below the poverty line mostly avail of their medical treatments in the barangay health station. Being a first-aid responder, the barangay health stations in the country often lack the tools and infrastructure that higher healthcare facilities could offer, like in the provincial or national hospital, where the ratio of physician to patient is better, and the medicines and other medical tools are readily available which cannot be provided by the barangay health station (Montecillo & Amparado, 2015). This shows that the poorer the people is, the further they are from better healthcare. However, despite the majority of poor people being able to avail only of the services of the barangay health station, but at least there are poor people who could also avail the luxury of medical treatments from private hospital and clinics which naturally would be affordable only for those living above the poverty threshold. Likewise, the higher number of people availing healthcare from the government owned facilities like the national, provincial and municipal/city hospitals over those from non-medical trained

personnel like *hilot* shows the trust the people have towards government offered healthcare (Blair, et. al, 2017). This indicates a faring performance of the municipality with respect to the sustainable development goal 3: Good health and well-being.

For SDG 6, a protected water source is essential in one's health. A contaminated water source could cause diseases (Risebro, et.al, 2012). In the municipality of Ocampo, Camarines Sur, due to the large probability of households wo use water from unprotected spring, lake, river or rain, dug well (balon), and tubed/piped shallow well (poso, artesian well, etc.) indicates that the poor households water source aren't safe and could be contaminated by disease-causing bacteria (Ding, et.al, 2017). This leaves poor households vulnerable to water-related diseases like cholera, etc (Pande, et.al, 2018).

Likewise, the larger probability of people who do not have any toilet facility at all to be poor over those who own and solely utilizes their water-sealed toilet shows that a large number of poor households in Ocampo, Camarines Sur is in need of a sanitary and decent toilet facility. The use of a sanitary toilet facility is essential in keeping a healthy society (Anurada, et. al, 2017). The use of sanitary toilets avoids diseases and helps keep communities clean as these prevents fecal transmission of diseases (Sun & Han, 2021). However, despite the higher probability of the poor people who have decent toilet facilities to be poor indicates that majority of the poor households have their own toilet, however, on average, around 40% of them are utilizing shared toilet facilities, or do not have access to sanitary toilet facilities after all. These indicates that the municipality of Ocampo is also not faring well with sustainable development 6: Clean Water and Sanitation.

For SDG 9, despite electricity being an essential household commodity (BuShehri & Wohlgenant, 2012), a high number of poor households in Ocampo cannot afford to have access to them. While it is also notable that the majority of the poor household have access to electricity, but then the large number of poor households who live in poverty who do not have access to it is alarming.

Electricity is a major commodity that households need. Electricity powers the household appliances which makes living easier for the members of the family. Without electricity, the household cannot enjoy appliances which other household enjoy. This could lead to dissatisfaction (Dugoua & Urpelainen, 2014) or it would basically make the household standard of living poorer as compared to other households (Maduka, et. al, 2020).

On the other hand, despite also of the fact that the internet is available in forms of various services like fiber, landline, broadband, and data (Magasic & Gretzel, 2017), as it has become one of the needed commodity during the pandemic, especially now that works and studies are being done from home (Kaushik & Guleria, 2020; Williamson, et. al, 2020), however a high number of poor households in Ocampo cannot afford to have access to them. While it is also notable that the some of the poor household have access to it, but then the large number of poor households who are struggling to be connected virtually is not a good sign for development as internet connectivity has always been correlated with development (Guerriero, 2015).

While access to electricity and the internet show a very high gap on the probability of the household being poor or non-poor, there may be other factors that may affect the household's access to these utilities (Dertinger & Hirth, 2020). But despite this, when it comes to sustainable development goal 9: Industry, Innovation and Infrastructure, the municipality of Ocampo is not doing well.

V. RECOMMENDATIONS

With these findings and conclusions, the researcher recommends that in SDG 1, the LGU would provide programs that would reduce the high number of households in Ocampo, Camarines Sur living below the poverty threshold. In SDG 3, the LGU may continue to strengthen the presence of its barangay healthcare units. The people, especially the poor avails most of its services when they are sick, so a good inventory of medicines as well as the presence of a healthcare professional in every barangay would help the municipality to further their good performance for the good health and well-being of the households.

In SDG 6, on the other hand, the LGU may develop local water sources so they may be safe for consumption. Studies on the integrity of the water for utilization by the general public, especially in communities which are not reached by the local water service provider should also be conducted so as to ensure that the water are safe for human consumption. This is also related with the toilet facilities which are lacking in many poor households in the municipality. The studies on water integrity are needed because many poor households are utilizing bodies of water as their toilets. In this lack of good toilet facilities, the government may partner with non-government organizations (NGO's) which could finance the construction of sanitary toilets, especially in communities which the households do not have such.

And finally, since that we are still into the pandemic and works and studies are often conducted online, the demand of households for electricity and internet connectivity is on the rise. The LGU may partner with internet service providers and the local electric cooperative so far-flung barangays which are challenged to have access to those would finally be able to connect to both electricity and the internet. The local executives may also provide free internet connectivity in their barangay halls which other barangays in the country are doing so also as projects. Likewise, the utilization of other sources of electricity like solar panels are also a good starter for households which aren't connected yet to electricity. This would improve the municipality's response to SDG 9.

REFERENCES

[1] Andriesse, E. (2018). Primary sector value chains, poverty reduction, and rural development challenges in the Philippines. Geographical Review, 108(3), 345-366.

[2] Angeles-Agdeppa, I., Denney, L., Toledo, M. B., Obligar, V. A., Jacquier, E. F., Carriquiry, A. L., & Capanzana, M. V. (2019). Inadequate nutrient intakes in Filipino schoolchildren and adolescents are common among those from rural areas and poor families. Food & nutrition research, 63.

[3] Anuradha, R., Dutta, R., Raja, J. D., Lawrence, D., Timsi, J., & Sivaprakasam, P. (2017). Role of community in Swachh Bharat Mission. Their knowledge, attitude and practices of sanitary latrine usage in rural areas, Tamil Nadu. Indian journal of community medicine: Official publication of Indian association of preventive & social medicine, 42(2), 107.

[4] Asi, Y. M., & Williams, C. (2018). The role of digital health in making progress toward Sustainable Development Goal (SDG) 3 in conflict-affected populations. International journal of medical informatics, 114, 114-120.

[5] Bertolini, P. (2019). Overview of income and non-income rural poverty in developed countries. Presentation. Retrieved, 5, 2020.

[6] Blair, R. A., Morse, B. S., & Tsai, L. L. (2017). Public health and public trust: Survey evidence from the Ebola Virus Disease epidemic in Liberia. Social Science & Medicine, 172, 89-97.

[7] BuShehri, M. A., & Wohlgenant, M. K. (2012). Measuring the welfare effects of reducing a subsidy on a commodity using micro-models: An application to Kuwait's residential demand for electricity. Energy Economics, 34(2), 419-425.

[8] Conchada, M. I. P., & Rivera, J. P. R. (2013). Assessing the impacts of food and non-food grants on poverty alleviation in the philippines: The case of pasay city. Malaysian Journal of Economic Studies, 50(1), 53-78.

[9] Dertinger, A., & Hirth, L. (2020). Reforming the electric power industry in developing economies evidence on efficiency and electricity access outcomes. Energy Policy, 139, 111348.

[10] Ding, Z., Zhai, Y., Wu, C., Wu, H., Lu, Q., Lin, J., & He, F. (2017). Infectious diarrheal disease caused by contaminated well water in Chinese schools: A systematic review and meta-analysis. Journal of epidemiology, 27(6), 274-281.

[11] Dufresne, Y., Jeram, S., & Pelletier, A. (2014). The true north strong and free healthcare? Nationalism and attitudes towards private healthcare options in Canada. Canadian Journal of Political Science/Revue canadienne de science politique, 47(3), 569-595.

[12] Dugoua, E., & Urpelainen, J. (2014). Relative deprivation and energy poverty: when does unequal access to electricity cause dissatisfaction?. International Journal of Energy Research, 38(13), 1727-1740.

[13] Ebert, U., & Moyes, P. (2002). A simple axiomatization of the Foster, Greer and Thorbecke poverty orderings. Journal of Public Economic Theory, 4(4), 455-473.

[14] Foster, J., Greer, J., & Thorbecke, E. (2010). The Foster–Greer–Thorbecke (FGT) poverty measures: 25 years later. The Journal of Economic Inequality, 8(4), 491-524.

[15] Foster, J. E. (2007). A report on Mexican multidimensional poverty measurement.

[16] Gong, R. (2020). Digital inclusion: Assessing meaningful internet connectivity in Malaysia. Khazanah Research Institute.

[17] Goswami, S., & Manna, S. (2013). Urban poor living in slums: a case study of Raipur City in India. Global Journal of Human Social Science Sociology & Culture, 13(4), 15-22.

[18] Guerriero, M. (2015). The impact of Internet connectivity on economic development in Sub-Saharan Africa. EPS Peaks, 1, 103-117.

[19] Hasan, M. K., Shahriar, A., & Jim, K. U. (2019). Water pollution in Bangladesh and its impact on public health. Heliyon, 5(8), e02145.

[20] Ren, Q., Huang, Q., He, C., Tu, M., & Liang, X. (2018). The poverty dynamics in rural China during 2000–2014: A multi-scale analysis based on the poverty gap index. Journal of Geographical Sciences, 28(10), 1427-1443.

[21] Jabbari, M., Shafiepour, M., Ashrafi, K., & Abdoli, G. (2020). Differentiating countries based on the sustainable development proximities using the SDG indicators. Environment, Development and Sustainability, 22(7), 6405-6423.

[22] Kostyak, L., Shaw, D. M., Elger, B., & Annaheim, B. (2017). A means of improving public health in low-and middle-income countries? Benefits and challenges of international public–private partnerships. Public health, 149, 120-129.

[23] Kaushik, M., & Guleria, N. (2020). The impact of pandemic COVID-19 in workplace. European Journal of Business and Management, 12(15), 1-10.

[24] Maduka, A. C., Madichie, C. V., & Ajufo, I. H. (2020). Modelling Household Electricity Consumption and Living Standard in Nigeria. African Journal of Economic Review, 8(2), 161-175.

[25] Magasic, M., & Gretzel, U. (2017, January). Three modes of internet connectivity during travel: remote, transit and residential. In ENTER 2017 Conference (pp. 24-26).

[26] McKenzie, D. (2007). Poverty traps and nonlinear income dynamics with measurement error and individual heterogeneity. The journal of development studies, 43(6), 1057-1083.

[27] Mitsumori, Y. (2018). An Analysis of TRIPS flexibility utilized by developing countries and newly industrialized countries. When structued guidance backfires: the effect of individual skepticism on auditors' plannin g materilaity, 197.

[28] Montecillo, C. P. V., & Amparado, M. A. P. (2015). Community Health Needs of Barangay Hipodromo, Cebu City, Cebu, Philippines. Journal of Research in Nursing, 1(1), 20-29.

[29] Mulligan, M., van Soesbergen, A., Hole, D. G., Brooks, T. M., Burke, S., & Hutton, J. (2020). Mapping nature's contribution to SDG 6 and implications for other SDGs at policy relevant scales. Remote Sensing of Environment, 239, 111671.

[30] Muñoz, J. F., Álvarez-Verdejo, E., & García-Fernández, R. M. (2018). On estimating the poverty gap and the poverty severity indices with auxiliary information. Sociological Methods & Research, 47(3), 598-625.

[31] Padda, I. U. H., & Hameed, A. (2018). Estimating multidimensional poverty levels in rural Pakistan: A contribution to sustainable development policies. Journal of Cleaner Production, 197, 435-442.

[32] Pande, G., Kwesiga, B., Bwire, G., Kalyebi, P., Riolexus, A., Matovu, J. K., ... & Zhu, B. P. (2018). Cholera outbreak caused by drinking contaminated water from a lakeshore water- collection site, Kasese District, south-western Uganda, June-July 2015. PloS one, 13(6), e0198431.

[33] Price, J. H., Khubchandani, J., & Webb, F. J. (2018). Poverty and health disparities: what can public health professionals do?. Health promotion practice, 19(2), 170-174.

[34] Raquiza, A. R. (2013). State structure, policy formation, and economic development in Southeast Asia: The political economy of Thailand and the Philippines. Routledge.

[35] Risebro, Helen L., Lynette Breton, Heather Aird, Alan Hooper, and Paul R. Hunter. "Contaminated small drinking water supplies and risk of infectious intestinal disease: A prospective cohort study." (2012): e42762.

[36] Seidman, G. (2017). Does SDG 3 have an adequate theory of change for improving health systems performance?. Journal of global health, 7(1).

[37] Silver, L., & Johnson, C. (2018). Internet connectivity seen as having positive impact on life in Sub-Saharan Africa.

[38] Son, H., & Yoon, S. (2020). Reducing energy poverty: Characteristics of household electricity use in Vietnam. Energy for Sustainable Development, 59, 62-70.

[39] Stelitano, L., Doan, S., Woo, A., Diliberti, M., Kaufman, J. H., & Henry, D. (2020). The Digital Divide and COVID-19: Teachers' Perceptions of Inequities in Students' Internet Access and Participation in Remote Learning. Data Note: Insights from the American Educator Panels. Research Report. RR-A134-3. Rand Corporation.

[40] Sun, S., & Han, J. (2021). Open defecation and squat toilets, an overlooked risk of fecal transmission of COVID-19 and

other pathogens in developing communities. Environmental chemistry letters, 19(2), 787-795.
[41] Takahashi, K. (2013). Pro-poor growth or poverty trap?: estimating intergenerational income mobility in rural Philippines.
[42] Tomaselli, M. F., Timko, J., Kozak, R., Bull, J., Kearney, S., Saddler, J., ... & Zhu, X. (2019). SDG 9: industry, innovation and infrastructure–anticipating the potential impacts on forests and forest-based livelihoods. Sustainable development goals: their impacts on forests and people. Cambridge University Press, Cambridge, 279-314.
[43] Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: digital technologies and distance education during the coronavirus emergency. Learning, Media and Technology, 45(2), 107-114.

APPENDIX

Table 1: Logistic regression results for Good Health and Well-Being (Medical Treatment of Sick and Medical Facility Visited); Clean Water and Sanitation (Main Source of Water Supply and Toilet Facility); and Industry, Innovation and Infrastructure (Availability of Electricity in Dwelling and Access to Internet).

Logistic regression — Number of obs = 2,971; LR chi2(27) = 463.96; Prob > chi2 = 0.0000; Log likelihood = −1776.7175; Pseudo R2 = 0.1155

PovTresh	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
MedTreat						
2	−2.145591	1.292099	−1.66	0.097	−4.678059	.386877
3	0	(empty)				
MedFacility						
2	−.031814	.430812	−0.07	0.941	−.8761901	.812562
3	.0363999	.4293665	0.08	0.932	−.805143	.8779427
4	−.1247685	.4191349	−0.30	0.766	−.9462578	.6967208
5	−.4499434	.4196784	−1.07	0.284	−1.272498	.3726111
6	−.2948827	.4799103	−0.61	0.539	−1.235489	.6457241
7	.3996767	.5144047	0.78	0.437	−.6085381	1.407891
8	.1867429	.4263056	0.44	0.661	−.6488006	1.022286
9	−.3611725	.5802966	−0.62	0.534	−1.498533	.776188
Water						
2	.4179936	.1893985	2.21	0.027	.0467793	.7892078
3	.1951811	.1509642	1.29	0.196	−.1007033	.4910654
4	.3264532	.1440569	2.27	0.023	.0441068	.6087995
5	.5552118	.1590291	3.49	0.000	.2435206	.866903
6	1.167384	.5239725	2.23	0.026	.1404166	2.194351
7	1.017355	.2891979	3.52	0.000	.4505377	1.584172
8	2.064437	1.076672	1.92	0.055	−.0458008	4.174674
9	1.415373	.7854536	1.80	0.072	−.1240879	2.954834
10	0	(empty)				
11	.0125543	.3920245	0.03	0.974	−.7557996	.7809082
Toilet						
2	.4634237	.1044187	4.44	0.000	.2587668	.6680807
3	.1895241	.1764897	1.07	0.283	−.1563893	.5354374
4	.6773746	.3143157	2.16	0.031	.0613272	1.293422
5	−.4855803	.5779572	−0.84	0.401	−1.618356	.6471949
6	.0399428	.5432166	0.07	0.941	−1.024742	1.104628
7	.5036237	.3820485	1.32	0.187	−.2451775	1.252425
8	1.065829	.2330567	4.57	0.000	.6090461	1.522612
2.Electricity	.8276466	.1314814	6.29	0.000	.5699479	1.085345
2.Internet	1.024873	.0924253	11.09	0.000	.8437225	1.206023
_cons	−.8211487	.4322892	−1.90	0.057	−1.66842	.0261225

Table 2: Marginal Computation for Medical Treatment of Sick

Predictive margins — Number of obs = 2,971
Model VCE : OIM

Expression : Pr(PovTresh), predict()

	Delta-method Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
MedTreat						
1	.5925806	.0083422	71.03	0.000	.5762302	.608931
2	.1909257	.1715407	1.11	0.266	−.1452879	.5271393

Variables:

MedTreat 1: Availed Medical Treatment
MedTreat 2: Did not Avail Medical Treatment

Table 3: Marginal Computation for Medical Facility Visited

Predictive margins Number of obs = 2,971
Model VCE : OIM

Expression : Pr(PovTresh), predict()

	Delta-method					
	Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
MedFacility						
1	.6201462	.0852377	7.28	0.000	.4530833	.7872091
2	.6135507	.0258882	23.70	0.000	.5628108	.6642905
3	.6276471	.0244086	25.71	0.000	.579807	.6754871
4	.5940881	.0159561	37.23	0.000	.5628148	.6253613
5	.5244705	.0171993	30.49	0.000	.4907605	.5581804
6	.5578822	.0522936	10.67	0.000	.4553887	.6603758
7	.6992185	.0580524	12.04	0.000	.5854378	.8129991
8	.6580497	.0213945	30.76	0.000	.6161173	.6999821
9	.5436292	.0878289	6.19	0.000	.3714878	.7157707

Variables:
MedFacility 1: Public Hospital (National)
MedFacility 2: Public Hospital (Provincial)
MedFacility 3: Public Hospital (Municipal/City)
MedFacility 4: Public Hospital (District)
MedFacility 5: Private Hospital/Clinic
MedFacility 6: Rural Health Units
MedFacility 7: Barangay Health Station
MedFacility 8: Non-Medical/Non-Trained Hilot/Personnel
MedFacility 9: Others

Table 4: Marginal Computation for Main Source of Water Supply

Predictive margins Number of obs = 2,971
Model VCE : OIM

Expression : Pr(PovTresh), predict()

	Delta-method					
	Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Water						
1	.5182087	.0266104	19.47	0.000	.4660533	.5703642
2	.6070079	.0297173	20.43	0.000	.5487631	.6652526
3	.5600761	.0196261	28.54	0.000	.5216096	.5985426
4	.5878828	.0148665	39.54	0.000	.558745	.6170205
5	.635145	.0194962	32.58	0.000	.5969332	.6733568
6	.7493683	.0857799	8.74	0.000	.5812428	.9174937
7	.7234054	.0462693	15.63	0.000	.6327193	.8140916
8	.8716446	.1117007	7.80	0.000	.6527152	1.090574
9	.7889335	.1169614	6.75	0.000	.5596934	1.018174
11	.520912	.0804553	6.47	0.000	.3632226	.6786014

Variables:
Water 1: Own use faucet, community water system (e.g. Maynilad)
Water 2: Shared faucet, community water system
Water 3: Own use tubed/piped deep well
Water 4: Shared tubed/piped deep well
Water 5: Tubed/piped shallow well (e.g. Poso, artesian well, etc.)

Water 6: Dug Well (e.g. balon)
Water 7: Protected spring
Water 8: Unprotected spring
Water 9: Lake, river, rain and others
Water 11: Bottled water (purified, distilled, mineral)

Table 5: Marginal Computation for Toilet Facility

Predictive margins Number of obs = 2,971
Model VCE : OIM

Expression : Pr(PovTresh), predict()

	Delta-method					
	Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Toilet						
1	.5526479	.0114617	48.22	0.000	.5301833	.5751124
2	.6509066	.0179704	36.22	0.000	.6156853	.6861279
3	.5937008	.036213	16.39	0.000	.5227246	.664677
4	.6930956	.0591315	11.72	0.000	.5772	.8089913
5	.4458099	.1253497	3.56	0.000	.200129	.6914908
6	.5613701	.1176076	4.77	0.000	.3308634	.7918769
7	.6590217	.0760605	8.66	0.000	.5099459	.8080975
8	.7624246	.0373545	20.41	0.000	.6892112	.8356379

Variables:
Toilet 1: Water-sealed, sewer septic tank, used exclusively by household
Toilet 2: Water-sealed, sewer septic tank, shared with other household
Toilet 3: Water-sealed, other depository, used exclusively by household
Toilet 4: Water-sealed, other depository, shared with other household
Toilet 5: Closed pit
Toilet 6: Open pit
Toilet 7: Pail system
Toilet 8: None (bodies of water. Backyard, public spaces)

Table 6: Marginal Computation for Electricity

Predictive margins Number of obs = 2,971
Model VCE : OIM

Expression : Pr(PovTresh), predict()

	Delta-method					
	Margin	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Electricity						
1	.5664693	.0095693	59.20	0.000	.5477138	.5852249
2	.7325054	.0219318	33.40	0.000	.6895199	.7754909

Variables:
Electricity 1: With Electricity
Electricity 2: Without Electricity

Table 7: Marginal Computation for Internet Access

```
Predictive margins                              Number of obs     =      2,971
Model VCE    : OIM

Expression   : Pr(PovTresh), predict()

------------------------------------------------------------------------------
             |            Delta-method
             |     Margin   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    Internet |
           1 |   .446812   .015827    28.23   0.000     .4157918    .4778323
           2 |  .6710798   .0106726    62.88   0.000     .6501619    .6919976
------------------------------------------------------------------------------
```

Variables:
Internet 1: With Internet Connectivity
Internet 2: Without Internet Connectivity

StataCommands (Do File):

```
import excel "/Users/michaelpostradovale/Desktop/Book1.xlsx", sheet("Sheet1") firstrow

logit PovTresh i.MedTreat i.MedFacility i.Water i.Toilet i.Electricity i.Internet

margin i.MedTreat

marginsplot

graph save Graph "/Users/michaelpostradovale/Desktop/Graph 1.gph"

margin i.MedFacility

marginsplot

graph save graph1 "/Users/michaelpostradovale/Desktop/Graph 1.gph", replace

margin i.Water

marginsplot

graph save graph1 "/Users/michaelpostradovale/Desktop/Graph 1.gph", replace

margin i.Toilet

marginsplot

graph save graph1 "/Users/michaelpostradovale/Desktop/Graph 1.gph", replace

margin i. Electricity

marginsplot

graph save graph1 "/Users/michaelpostradovale/Desktop/Graph 1.gph", replace

margin i.Internet

marginsplot

graph save graph1 "/Users/michaelpostradovale/Desktop/Graph 1.gph", replace

save "/Users/michaelpostradovale/Desktop/DevEcon.dta"
```