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Salt-Induced Aggregation of Polyallylamine-Coated Gold Nanoparticles (PAH-AuNP) for Rapid Detection of Methyl Parathion

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ABSTRACT

Several approaches for the detection of methyl parathion (MPT) have been reported. However, concern about the complexity and complicated instrumentation hampers its application for rapid analysis. Hence, colorimetric mode of detection for rapid analysis of MPT utilizing the unique property of an aggregated gold nanoparticles is reported herein. Polyallylamine-coated gold nanoparticles (PAH-AuNP) were prepared, and recombinant methyl parathion hydrolase (MPH) was used to specifically hydrolyze MPT into paranitrophenol (PNP). Different experimental conditions, such as the pH of the salt-induced aggregation of AuNP, condition for the immobilization of MPH, the concentration of the MPH enzyme, the duration of incubation, among others were evaluated. Results showed that the prepared AuNP readily recognized the product (PNP) upon salt-induced aggregation when PNP is all converted to its ionic form. Rapid detection was obtained within 5 minutes at a pH greater than 7 at concentrations ranging from 0.1-14 ppm of MPT. The minimum MPT concentration that can be detected using this technique is 0.1 ppm. An ongoing experiment is currently being undertaken to demonstrate the applicability of the method for the detection of similar structure pesticides. Likewise, mechanistic study to further explain the obtained results is also being considered and will be incorporated in the subsequent report.

Keywords: gold nanoparticles, polyallylamine hydrochloride, methyl parathion, methyl parathion hydrolase

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1 Introduction

Application of nano-size materials in various fields is the most active areas of research nowadays. Among other nanomaterials being explored, gold nanoparticles have received great interest in the scientific community due to its fascinating properties and versatile surface chemistry. Functionalized gold nanoparticles were extensively studied for various applications such as environmental (Chen, 2011; Wang and Yu, 2013), biomedical (Cai et al., 2008; Pissuwan et al., 2011; Sperling et al., 2008), energy (de Aberasturi et al., 2015) as well as for catalysis application (Daniel and Astruc, 2004). In particular, gold nanoparticles were being utilized for the detection of significant environmental pollutants, including detection of pesticides (Bai et al., 2015; Bakar et al., 2012; Lisha et al., 2009; Liu et al., 2014).

Detection of methyl parathion (MPT) calls for serious consideration due to its massive use as insecticide applied to crops and other agricultural products, particularly in the developing countries. Methyl parathion is an organophosphate pesticide widely used for household and agricultural applications for the chewing and sucking of insects in a wide range of crops. The compound is considered by Environmental Protection Agency (EPA) as a highly toxic insecticide (toxicity class I) and is classified as Ia (extremely hazardous) pesticide by the World Health Organization (WHO) (Yang et al., 2008; WHO, 2004). Concerns about the use of MPT have been raised due to its persistence and potential toxicity in humans and animals. MPT is highly toxic by inhalation and ingestion, and moderately toxic by dermal adsorption (Dikshith, 2013). It has been considered as a cholinesterase inhibitor for which uptake via inhalation will lead to a bloody nose, coughing, chest discomfort, and difficulty in breathing (PesticideNews, 1995). On the other hand, extreme cases of exposure of MPT will affect the central nervous system, producing in-coordination, slurred speech, loss of reflexes, weakness, fatigue, and eventual paralysis of the body extremities and respiratory muscles (PesticideNews, 1995). MP has been banned in some countries and misused in developing countries. Thus, there is a need for the detection and regulation of methyl parathion. The conventional method of detecting MPT is the use of highly complex instruments such as gas chromatography (GC), GC/MS, HPLC, Spectrophotometry, TLC or polarography (de Souza Pinheiro et al., 2011; De Llasera et al., 2009; Tiwari et al., 2013; Castanho et al., 2003). Although these methods offer to be accurate and sensitive, they also suffer the drawbacks such as being expensive, tedious, time-consuming, labor-intensive, and often requires prior sample pre-treatment. Simple and hand-held methods for the detection of MPT have been reported in several papers such as the use of acetylcholinesterase (AChE) inhibition-based amperometric and optical techniques (Anh et al., 2011). A novel method, however, for the fast detection of MPT is highly desirable. Herein, the use of gold-nanoparticle enzyme for the rapid detection of methyl parathion is reported.

Within the last few decades, nano-size metal particles have received a great deal of interest owing to their unique optical and electronic properties (Yu et al., 2003). The noble metals exhibit the strong surface plasmon resonance which allows them to present the intense color in the colloidal solution (Liu et al., 2010). The exact surface plasmon absorption is dependent on several parameters such as shape, size, medium, the distance between particles (Liu et al., 2010). The dispersed gold nanoparticles (AuNPs) around 16 nm diameter have a red color with a surface plasmon absorption band centered at 520 nm. When the interparticle distance decreases to less than the diameter of the particle, the coupling interactions result in a red-shift of the resonance wavelength and also lead to significant aggregation of AuNPs with the distinctive color change from red to blue.

Gold aggregation or clustering can be induced by physical methods such as increasing the ionic strength of the solution (Wang et al., 2001) or the addition of molecules to be able to connect one nanoparticle to another (Gu et al., 2001). This principle can be

used to detect a wide range of analytes from DNA to proteins and metal ions (Zhang et al., 2003). In this study, aggregated gold nanoparticles were utilized for the rapid detection of the target MPT analyte. For the first time, polyallylamine (PAH)-coated gold nanoparticles (PAH-AuNPs) were prepared and applied for the detection of methyl parathion using its hydrolysis product, para-nitrophenol (PNP). To the best of our knowledge, this is the first attempt to use a positively-coated gold nanoparticle for the direct detection of MPT. The recombinant methyl parathion hydrolase (MPH) was utilized to specifically hydrolyze methyl parathion to form the hydrolysis product, para-nitrophenol (Fig. 1). Figure 3 shows the schematic representation of the proposed mechanism for colorimetric detection of MPT thru salt-induced aggregation of gold nanoparticles. As shown, the enzyme will catalyze to produce para-nitrophenol. In an aqueous substrate, the para-nitrophenol will be further dissociated to form a bright yellow product, para-nitrophenolate (Fig. 2). The resulting product will then carry a net negative charge, of which the positively-charged AuNPs will bind into it thru electronic interaction. During the interaction, an inter-linking PAH-AuNPs will be formed, and further nanoparticle aggregation will occur in the presence of the salt. In contrast, conversion of MPT to para-nitrophenol is not possible without the presence of an enzyme, and thus there is no nanoparticle aggregation.

2 Experimental

2.1 Materials

All reagents and chemicals were used as received. Chloroauric acid (HAuCl_4) and polyallylamine hydrochloride (PAH) (MW 15,000) were purchased from Sigma-Aldrich. Tris(hydroxymethyl)amino methane (TRIS) from Carlo Erba. Trisodium citrate ($\text{C}_6\text{H}_5\text{Na}_3\text{O}_7 \cdot \text{H}_2\text{O}$) was purchased from VWR International Ltd. Hydroxyethyl cellulose (HEC), methyl parathion analytical standard and polyethylene glycol (PEG) were purchased from Sigma-Aldrich. Methyl parathion Hydrolase was provided by Dr. Dau Hung Anh of KMUTT. All glasswares used in the preparation of gold nanoparticles were washed with aqua regia (1:3 $\text{HCl}:\text{HNO}_3$) before use to eliminate contamination. Absorbance measurements were taken from SpectraSuite Spectrophotometer in a 300 μL cuvette with an integration time of 4500 μs .

2.2 Method

Synthesis of Citrate-coated Gold Nanoparticles (AuNP)

Citrate-capped gold nanoparticles were synthesized following the published protocol (Daniel and Astruc, 2004). Briefly, ten milliliters (10 mL) of 5 mM (HAuCl_4) was added with 180 mL ultra pure water (MQ water) and the solution was allowed to boil with constant stirring. Then, ten milliliters of (10 mL) of 0.5% trisodium citrate was added to the mixture, after which the color turns from yellow to colorless. The resulting solution was allowed to boil further until the solution turns from colorless to purple then finally to wine red. Additional heating of about 30 minutes was made, and then the solution was cooled to room temperature with constant stirring. The volume of the solution was adjusted with deionized water to make it to a final volume of 200 mL. The prepared gold nanoparticles have an approximate concentration of 0.25 mM.

Synthesis of Poly(allylamine)-coated Gold Nanoparticles

The polyallylamine-coated gold nanoparticles (PAH-AuNP) were synthesized in smaller volumes to avoid aggregation of samples and to ensure that citrate in gold nanoparticles

can be easily displaced upon mixing with polyallylamine hydrochloride (PAH). In brief, three hundred microliters ($300\mu\text{L}$) of 10 mg/mL of PAH was added to $1500\mu\text{L}$ of citrate-coated AuNPs. The resulting mixture was immediately shaken for about 2 minutes using vortex shaker. The mixture was then continuously shaken for one hour and then centrifuged at 11000 rpm for 30 minutes. The supernatant was discarded, and the nanoparticle pellet was washed with $500\mu\text{L}$ deionized water. The mixture was centrifuged for another 30 minutes, and the prepared PAH-coated AuNP was re-constituted with MQ water to a final volume of $750\mu\text{L}$. Several AuNPs were also prepared in a similar way and all of the prepared PAH-AuNP were pooled and homogenized in one solution.

Effect of incubation buffer on Enzyme Immobilization

Immobilization of enzyme, methyl parathion hydrolase (MPH), was made by adsorption onto the nitrocellulose membrane. Two microliters ($2\mu\text{L}$) of recombinant MPH was placed on a nitrocellulose membrane ($2 \times 8\text{ cm}$). The membrane was then allowed to dry for one hour at $35^\circ\text{C} \pm 1^\circ\text{C}$. The immobilized enzyme was then immersed in $700\mu\text{L}$ 0.1% HEC (or different immobilizing solution) for about 30 seconds until a smooth surface is seen and then cured overnight at 35°C . The immobilized enzyme was then immersed in 1 ppm methyl parathion (MP) ($0.1\text{--}10\text{ ppm}$ in 10 mM TRIS and hydrolysis reaction was conducted at $30^\circ\text{C} \pm 1^\circ\text{C}$ for 1 hour. Then, the reaction was stopped and the nitrocellulose membrane was removed from the solution. The hydrolysis products were then used for the aggregation assay.

Induced Aggregation Assay of PAH-AuNP

Two hundred forty microliters ($240\mu\text{L}$) of the prepared PAH-AuNP was placed in an Eppendorf tube, and about thirty microliters ($30\mu\text{L}$) of the buffer ($\text{pH } 9.1$) was added to PAH-AuNP, and another $30\mu\text{L}$ of the hydrolysis products were added. The aggregation was induced by the addition of $4\mu\text{L}$ of 0.3 M NaCl. The absorption was measured at 518.5 nm , the λ_{max} of AuNP (red AuNP), and at 618.1 nm (blue AuNP). The absorbance was recorded at a specified time of aggregation. Aggregation of control solution (a solution derived from an MPT analyte immersed in a nitrocellulose membrane without the immobilized enzyme) was also conducted in a similar manner.

3 Results and Discussion

3.1 Aggregation of PAH-AuNP at Different pH

Aggregation of the prepared polyallylamine-hydrochloride gold nanoparticles (PAH-AuNP) with the substrate MPT was tested at different pH. Evaluation at different pH was conducted to investigate the effect of pH on the degree of aggregation of PHA-AuNPs since the target hydrolysis product para-nitrophenol (PNP) will be ionized at a higher pH. It was observed that aggregation of gold nanoparticles in the presence of MPT itself was very slow. Plausibly, this is because of the effective coating of the AuNPs surface with the high-molecular weight polymer, polyallylamine. It has also been observed that after the coating process, the obtained nanoparticles are well-dispersed in the solution which further justifies the excellent stability of the resulting nanoparticles. Also, complete coating with polyallylamine indicates that the surface of the AuNPs is perfectly stabilized that makes it protected from exposure to the surrounding medium. Thus, aggregation was made by inducing it with sodium chloride solution (6.6 mM NaCl). The extent of aggregation was measured by the ratio of the absorbance at 618.1 nm when PAH-AuNP is aggregating and 518.5 nm when PAH-AuNP is highly dispersed (not aggregated). The

figure shows (Fig. 4) that the prepared PAH-AuNPs will readily aggregate at higher pH ($\text{pH} > 8$). The obtained results corroborate to the fact that polyallylamine hydrochloride (PAH) exists in a deprotonated form in slightly basic solutions and above its pK_a value (Dorris et al., 2008; Fang et al., 1999; Sartori et al., 2011). As reported, PAH is a weak cationic polyelectrolyte with many ionizable amine groups in its backbone. PAH exists in fully protonated in neutral and acid solutions but partly deprotonated in slightly basic solutions (Sartori et al., 2011; Fang et al., 1999). Likewise, changing the charge density as a function of pH causes the polymer chain to transition between tightly coiled and highly extended conformation (Grunlan et al., 2008). PAH is a weak polybase at high pH and becomes more extended at low pH as its positive charge density increases. Thus, as pH is increased, PAH loses positive charge density and becomes more likely to form a coiled structure. Conversely, at a higher pH, the polymer (PAH) can be easily attracted to other gold nanoparticles leading to a decrease in the interparticle distance and promoting aggregation. It was observed that the interaction of the derived hydrolysis product of MPT (para-nitrophenol) and the PAH-AuNPs is ubiquitous at higher pH ($\text{pH} > 8$). Most likely, at higher pH, the coiled conformation of the PAH coating predominates that would probably promote nanoparticles to aggregate. In addition, possible interaction of the MPT-derived product (para-nitrophenol) and the gold nanoparticles is most likely to happen via S-Au bond and P-Au interactions and thus causing the nanoparticles to aggregate. However, at a lower pH, all of the amine groups ($-\text{NH}_3^+$) are protonated and therefore could increase the repulsion between the particles leading to stabilization of AuNPs.

In this experiment, it was observed that at a certain pH range (5-9), both the MPT (substrate) and control solution showed indistinctive aggregation. The distinction on the aggregation behavior of the MPT substrate and the control is apparent only at a pH greater than 8. From the obtained results, it is therefore important to explore on the possible mechanism to enhance the aggregation differentiation caused by both the substrate and the buffer to improve the sensitivity of the technique. In this present investigation, absorbance correction from the buffer was made to eliminate possible interferences from the buffer.

3.2 Aggregation of AuNP by the Hydrolysis Products of MPT at Different pH

Methyl parathion (MPT), the substrate, was hydrolyzed first with methyl parathion hydrolase (MPH) to isolate the effect of MPT on AuNP aggregation. The hydrolysis products were then detected with PAH-AuNP. However, to minimize the effect of high pH on gold nanoparticles, aggregation of AuNP was induced by the addition of salt. Hydrolysis products were made at a low salt concentration, 3.3 mM NaCl solution in AuNP. Aggregation of AuNP with hydrolysis products was studied at a different pH to determine if the ionized form of the target compound, para-nitrophenol (PNP) will affect the aggregation of AuNP. As expected, significant aggregation of AuNP was noted at pH value greater than its pK_a value (pK_a 7.15). In this study, it was observed that more significant aggregation was attained at pH 8. This implies that highly ionized para-nitrophenol promotes nanoparticle aggregation via electrostatic interaction with the positively charged AuNPs and through the negative oxygen of the nitro group ($-\text{NO}_2$) and the ionized phenol group ($-\text{OH}$). It is important to note that when the PAH polymer is fully charged, the conformation of the polymer tends to form a rod-like structure because of the electrostatic repulsions. However, when the charge density of the polymer chains is reduced, they adopt a more collapsed globular structure (Burke and Barrett, 2005). Furthermore, the charge density of the chains affects their physical properties

and thus affects its properties in solution (Burke and Barrett, 2005). In this proposed mode of interaction, the p-nitrophenol acts as a linker between PAH-AuNP which leads to aggregation of the nanoparticles (Fig. 3). Importantly, PAH loses its positive charge density at higher pH and thus becomes more likely to form a coiled structure. This observation supports the obtained results that more gold nanoparticle aggregation was observed at higher pH.

3.3 Effect of Incubation buffer on MPH immobilization

The gold nanoparticle-based colorimetric assay can rely on the assembly of gold nanoparticles in which an enzyme reacts with the free substrate first, and the released products can crosslink the AuNPs which leads to the formation of large aggregates (Liu et al., 2007). In this paper, we report the aggregation of AuNP based on the hydrolysis of methyl parathion to produced para-nitrophenol upon the action of recombinant methyl parathion hydrolase (MPH). However, the presence of the enzyme during the hydrolysis of MPT in gold nanoparticles could result to steric hindrance for the released products, which could possibly amplify the aggregation of AuNPs. Moreover, the MPH could also aggregate the AuNP itself. To circumvent the issue and for the desired application, the MPH is immobilized on the nitrocellulose membrane. Thus, optimization for the immobilization of MPH on nitrocellulose membrane was studied, and different polymers such as polyethylene glycol (PEG) and hydroxyethyl cellulose (HEC) were used to ensure that the MPH does not diffuse into the solution. PEG has been used in some studies (Guarise et al., 2006; Liu et al., 2007) to stabilize the nanoparticles and to prevent the interaction of proteins with gold nanoparticles while hydroxyethyl cellulose (HEC) had been widely used for the encapsulation of some drugs. It has been found out that 0.1% HEC-rinsed MPH in nitrocellulose membrane provides the greatest sensitivity on the aggregation of AuNP without causing the AuNP solution to aggregate even the nanoparticle is left undisturbed (Fig. 6A and 6B). This is because HEC can easily adhere to the surface of nitrocellulose membrane via electrostatic interaction than PEG thus, can easily keep the enzyme in place within the membrane. Hence, HEC solution was used to immobilize MPH on nitrocellulose membrane on the subsequent experiments.

3.4 AuNP Aggregation at Different Volume Ratio of AuNP and Hydrolysis Products

Optimization on the volume ratio of AuNP and hydrolysis products were studied in order to support the hypothesized idea that the ionized PNP serves as a linker between gold nanoparticles. As expected, lowering the volume loading of hydrolysis products on AuNP, the more pronounced is the aggregation because of the increased ratio between AuNP and PNP (Fig. 7). It is believed that the higher the number of PNP interacting on the surface of AuNP the more crosslinking is provided by the PNP between gold nanoparticles. Apparently, the aggregation of AuNP increases as the volume ratio of AuNP-PNP also increases. However, at a volume ratio of 1:12, aggregation also lessens to some extent. This may be attributed that PNP particles maybe also provide repulsion to other PNP particles instead of interacting to the positively charged AuNP, and thus lessens the aggregation. In this experiment, the volume ratio of 1:8 was considered to be optimal in aggregating AuNP.

3.5 Enzyme Concentration affects the nanoparticle aggregation

It is known that the higher the amount of enzyme being used, more products can also be obtained. In this experiment, increasing the amount of enzyme immobilized on

nitrocellulose also results in an increase in the amount of products, and thus increasing the extent of aggregation (Fig. 8A). However, too much loading of enzyme on the membrane results in an increased protein-protein interaction as there will be less surface of the membrane for which the enzyme can interact. This result to high loosely bound protein on the membrane which results to leaking and contribute to aggregation (Fig. 8B). Thus, the amount of enzyme that can be loaded in the membrane ranges from 1-3 μ L in the specified dimension of the membrane, and the optimum concentration that gives highest aggregates (Fig. 8b) without sacrificing the control is at 3 μ L.

3.6 Effect of MPT Substrate Concentration on the Dynamic of Nanoparticle Aggregation

Different substrate (MPT) concentration (0.01-14 ppm) was allowed to undergo hydrolysis in the presence of an immobilized enzyme. For a complete reaction, it is believed that the product PNP will also have a similar concentration of the initial substrate concentration (0.01-14 ppm). As expected, the higher the concentration of the produced product, the greater is the aggregation (Fig. 9A). As the time of aggregation increases, the extent of aggregation (by monitoring the intensity of the color change) also increases (Fig. 9A). In fact, the plot of the ratio of absorbance (A₆₁₈/A₅₁₈) and the log concentration of products in ppb gives a good linearity from 0.01 ppm to 14 ppm (Fig. 9B) with an R^2 value of 0.9942 within 5 minutes. As aggregation time increases to 10 minutes, the extent of aggregation also increases as can be seen on a high A₆₁₈/A₅₁₈ value (Fig. 9A).

The R^2 value of the absorbance ratio (A₆₁₈/A₅₁₈) is plotted versus log ppb concentration of products. It is noted that the R^2 value increases from 0.940, 0.991 and 0.994 for 0.5 minutes, 4 minutes and 9 minutes, respectively (Fig. 10A). The highest R^2 value was obtained within 7 minutes of aggregation (0.997) while it is noted that there is a slight decrease in linearity at 10 minutes (0.988) (Fig. 10A). This can be ascribed to the fact that great aggregation of AuNP can lead to the surface interaction of AuNP and great clustering of gold nanoparticles which may lead to the collapse of the blue color of the solution and turns into a colorless one. Visual color change for the detection of MPT is observed even at 5 minutes up to 10 minutes (Fig. 10B). Based on the results obtained, it was observed that the limit of detection is found to be 0.1 ppm where an apparent blue color can still be obtained (Fig. 10B). Lower than 0.1 ppm will have slight color change that is close to that of control (Fig. 10B).

4 Conclusion

Optimization of AuNP for the rapid detection of methyl parathion was conducted at different conditions. Experiments have shown that methyl parathion substrate and the buffer did not have an effect on the aggregation of AuNP at a low pH (5-8) but affect at a higher pH. Detection of methyl parathion using polyallylamine-coated gold nanoparticles was made with the specificity of the hydrolysis products of methyl parathion (MPT) with methyl parathion hydrolase (MPH). Aggregation of AuNP is more apparent at pH 9, the pH higher than the pH (pH 8.6) of the functionalized group polyallylamine hydrochloride on AuNP. Immobilization of methyl parathion hydrolase on nitrocellulose membrane was enhanced with the hydroxyethylcellulose (HEC) agent. The optimized volume of AuNP and hydrolysis products for the aggregation of AuNP was also conducted. Aggregation of AuNP is more apparent when the hydrolysis reaction was increased with an increased hydrolase concentration and increased substrate (MPT) concentration. The minimum MPT concentration that can be detected using the salt-induced AuNP is 0.1ppm. Rapid

detection of methyl parathion through its hydrolysis product can be made at 2-5 minutes, shown by the linearity of aggregation and time, after which the AuNP start to collapse at 10 minutes. At 5 minutes, a good linear relationship of 0.994 is obtained between AuNP aggregation and time for the detection of MPT.

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Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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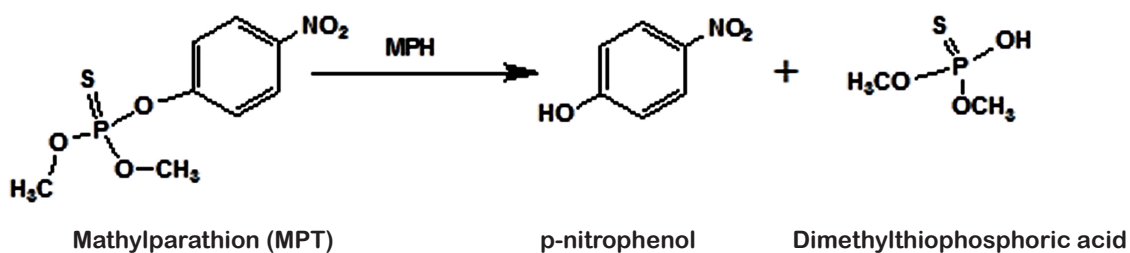


Fig. 1: Hydrolysis reaction of methyl parathion (MPT)

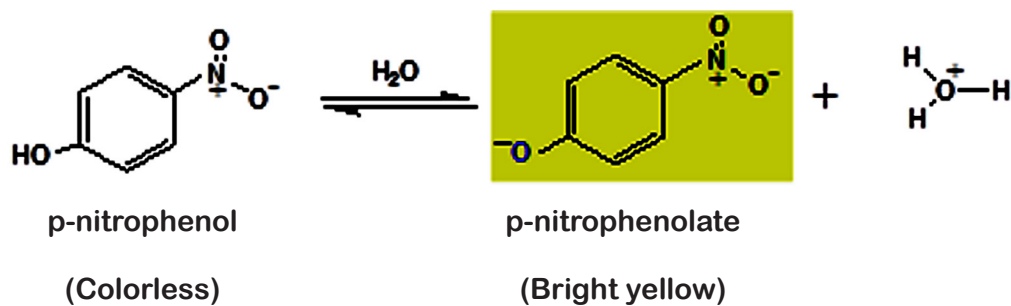


Fig. 2: Dissociation reaction of para-nitrophenol

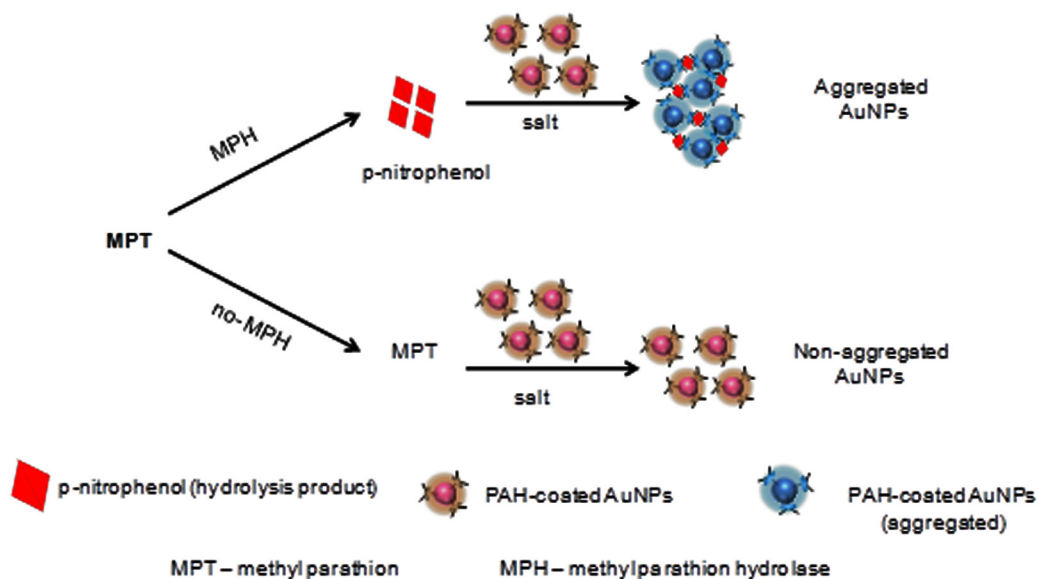


Fig. 3: Schematic diagram reflecting the aggregation mechanism of PAH-coated AuNPs

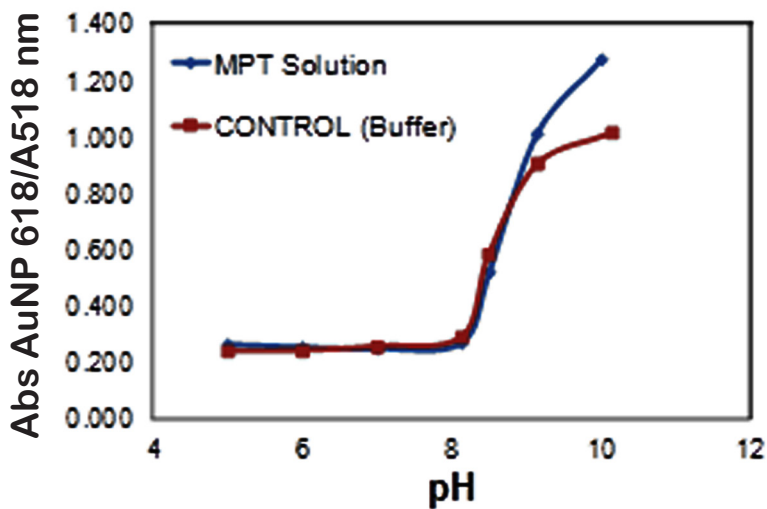


Fig. 4: Effect of pH on PHA-AuNPs Aggregation (Aggregation of PHA-AuNP was made at 1:6 AuNP: MPT volume ratio)

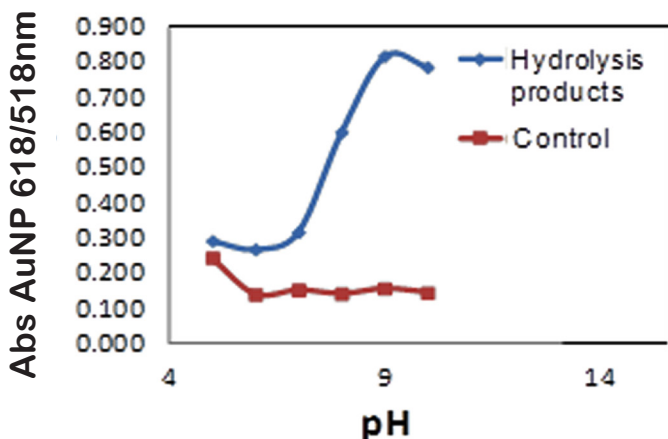


Fig. 5: Effect of pH on the Aggregation of PAH-AuNPs in Hydrolysis Products

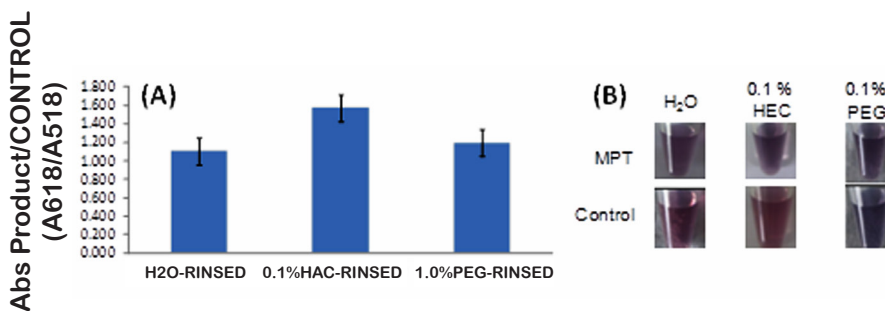


Fig. 6: Effect of immobilizing solution on MPH on the aggregation of AuNPs (A) Absorbance measurement after 5 minutes reaction time and (B) Naked eye inspection after 5 minutes reaction time.

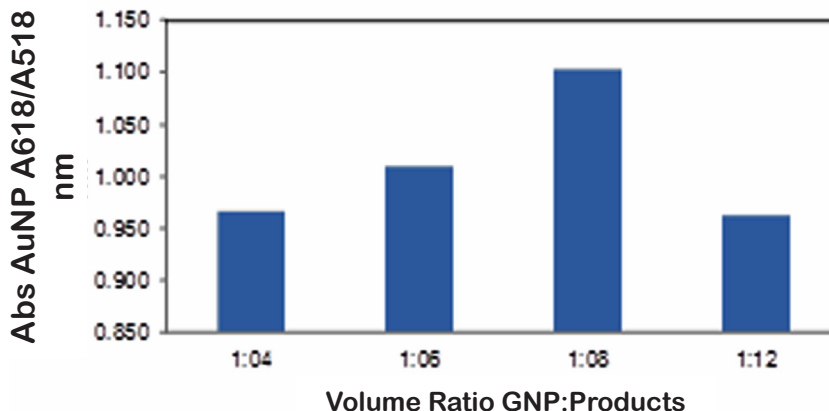


Fig. 7: Effect of AuNP-Product Volume Ratio on AuNP Aggregation

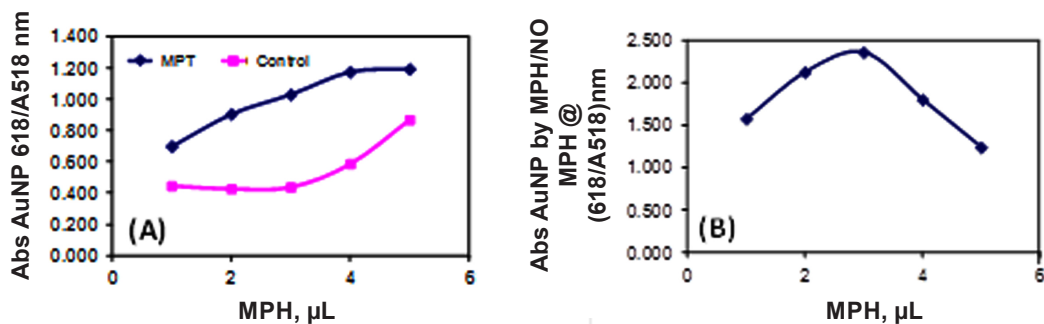


Fig. 8: (A) Optimization of AuNP aggregation as a function of MPH concentration on AuNP; (B) Optimization of AuNP aggregation at different MPH concentration (corrected with the control).*

*Absorbance taken after 5 minutes aggregation.

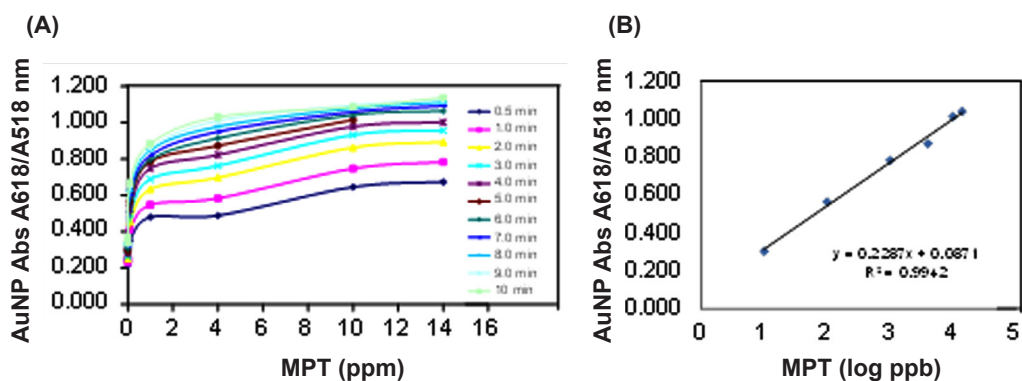


Fig. 9: Absorbance ratio of different MPT concentration; (B) Plot of Absorbance and log concentration of MPT substrate*

*Absorbance taken after 5 minutes aggregation.

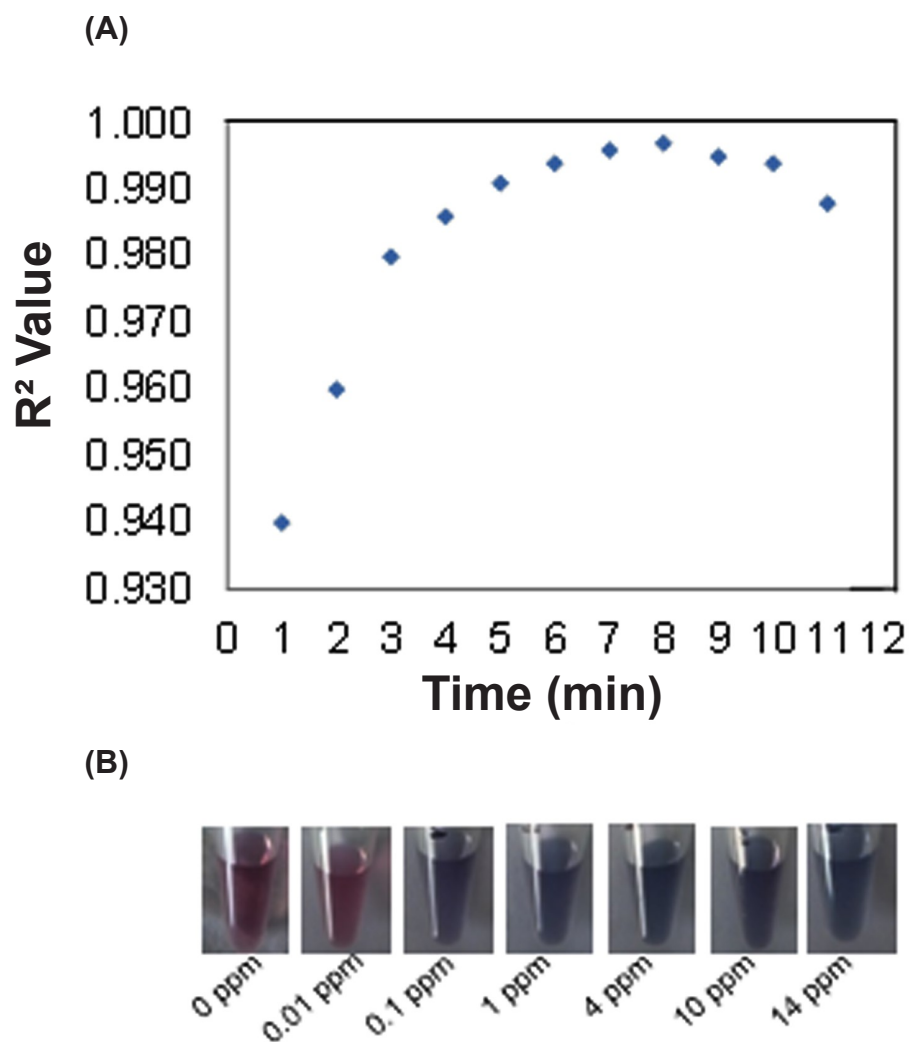


Fig. 10: (A) The trend of the plot of R^2 value on the linearity of the aggregation of AuNP at various aggregation time; (B) Naked eye visual inspection on the aggregation of AuNP at different MPT concentration*

*Absorbance taken at 5 minutes aggregation.



Survival and Growth of Plant Species in Agroforestry System for Progressive Rehabilitation of Mined Nickel Sites in Surigao del Norte, Philippines

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ABSTRACT

This paper describes the survival and growth of different plant species in an agroforestry system during the early stages of development to assist natural re-vegetation for nickel mine rehabilitation. Narrow agroforestry strips were established along the contours in nickel mined areas to restore the vegetation and eventually serve as a natural filter for soil erosion. A combination of trees and other plant species were planted at various elevations of the mined land. In determining the species with potential as pioneers in mine rehabilitation, the survival and growth of the plant species used in rehabilitation were assessed. Results reveal that with proper cultural management, the survival of the various tree species in the constructed agroforestry strips can reach as high as 100%. *Leucaena leucocephala*, *Pterocarpus indicus*, *Samanea saman*, *Muntingia calabura* and *Terminalia microcarpa* showed relatively high survival in the field. The same species exhibited favorable initial growth as measured by plant height and stem diameter despite the harsh conditions of the mined-out areas. These plant species have high potential to be used in the rehabilitation of nickel areas after surface mining.

Keywords: nickel mining, soil erosion, forest strip, progressive rehabilitation, ecorestoration

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1 Introduction

In nickel ore extraction, surface mining is usually adopted by removing the topmost soil layers stripping off the associated vegetation in the process. This often leads to erosion of soil particles and associated minerals that eventually cause siltation to nearby freshwater and marine water bodies. Establishing narrow strips of vegetation or forest strips to mitigate the impacts of nickel mining to interconnected ecosystems can be the alternative to the natural vegetation. In the establishment of forest strips, contour planting, integration of fruit trees and planting of flowering plant species to attract pollinators are integrated. The role of agroforestry systems in maintaining species diversity is significant, thus, these systems can play an important role in biodiversity conservation in human-dominated landscapes (Bhagwat et al., 2008). While there is a growing recognition of the long-term human involvement in forest dynamics and on the importance of conservation outside protected areas, these conservation efforts are mostly aimed to conserve pristine nature in protected areas. The past and present evidence clearly indicates that agroforestry, as part of a functional landscape, can be a viable land-use option as it offers a number of ecosystem services and environmental benefits in addition to alleviating poverty (Jose, 2012). Agroforestry systems offer a wide array of ecosystem services, such as regulation of soil and water quality, carbon sequestration, support for biodiversity among others. However, proper management is essential because agroforestry can also be the source of numerous disservices depending on management practices.

Since agroforestry was introduced, it has been viewed to provide the necessary combinations of plant species that can serve in buffering soil erosion, supply food and offer protection to biodiversity. With the variety of plant species in agroforestry that support a diverse faunal composition, soil fertility and nutrient cycling are also improved. Thus the establishment of forest strips in mined land adopting agroforestry concepts is viewed to re-establish the population of keystone species that can sustain the biodiversity towards ecosystem restoration. However, different plant species may have varied survival requirements. In a mined land where the condition is generally harsh due to the quality of soil and the full exposure of the land to factors such as extreme temperatures, rain and the wind among others, there is a need to identify plant species that can survive and grow given the condition of a mined land. The results of this study can be very useful in planning for mine rehabilitation of nickel areas.

2 Methodology

2.1 Study Site

The study was conducted in Hinatuan Mining Corporation (HMC) in Hinatuan Island, Taganaan, Surigao del Norte and Taganito Mining Corporation (TMC) in Claver, Surigao del Norte. The nickel mines were established mines in the declared Surigao Mineral Reserve located in northeastern Mindanao, Philippines (Fig. 1).

2.2 Establishment of the Agroforestry Strips

Different tree species were propagated in the nursery and planted in the identified mined-out study sites of HMC and TMC. The various species were planted by cluster across the mountain slope to provide the initial sources of propagules for assisted re-vegetation of the sites. In addition, fruit trees and flowering plant species were also included to attract pollinators, which are important agents of dispersal. Planting was done on July 2014 for HMC, while it was done on October 2014 for TMC. However, despite the project duration to last only until June 2015, the monitoring and assessment of the

ecobelt continued in partnership with the mining company's Environmental Management Division.

Soil amelioration technologies for soil quality improvement (*e.g.* application of commercial fertilizer and compost) were introduced to boost plant growth and development. Watering was also done when the plants were still young, especially, during dry spell.

2.3 Data Collection and Analysis

Data such as survival rate of the various plant species, plant growth as measured by plant height and stem diameter were gathered to assess the performance of different plant species for rehabilitation in nickel mined-out areas. The data on survival rate were taken three months after planting, while the data on growth performance were gathered a year and 1.5 years after planting for HMC, while these were taken a year and 1.1 years after planting for TMC. Data were analyzed using descriptive statistics, using the sums, mean and frequency.

3 Results and Discussion

The percentage survival of tree species planted in the agroforestry strips established in the mined-out areas of HMC and TMC is presented in Tables 1 and 2. The survival rate of the various plant species is necessary for consideration in mine rehabilitation to determine the suitable species tolerant to the unfavorable conditions of the mined sites. The different species planted in HMC had over 50% survival on the average. Narra (*Pterocarpus indicus*), which is a native species, reached to as high as 100%. Lower survival was noted for Mabolo (*Diospyrus philippinensis*), Sampalok (*Tamarindus indicus*) and Rambutan (*Nephelium lappaceum*). The low survival rate of rambutan in the site can be attributed to the poor soil condition. The nickel mined-out area is generally deficient in organic matter which cannot favorably supply the survival requirements of rambutan. The results of the soil analysis indicated very low levels of macronutrients (NPK), particularly, the organic matter. Organic matter is vital in the survival of plants. However, only 0.66 to 1.52% OM (Table 3) was recorded in the backfilling material of HMC, while only 0.41 to 0.72% OM (Table 4) in TMC. The tree grows well in deep soil, clay loam or sandy loam rich in organic matter, and thrives on hilly terrain as they require good drainage (Tindall, 1994; Salakpetch, 2003). The survival of plants and their initial development are basic in re-vegetation inasmuch as these determine the success of mine rehabilitation. Thus, nursery trials for various species planted on soil with high nickel and iron content are essential. This will ensure future success and cost-effectiveness in nickel mine rehabilitation. In addition, the survival of plants with high leaf litter production that can potentially contribute to the enrichment of the soil is crucial.

In the past few years in China, establishment and colonization of several pioneer plant species growing on Pb/Zn mine spoils have been successful (Wong, 2003). Among the pioneer species are grasses and legumes. Plant species that easily colonize mined-out areas include *Vetiveria zizanioides* grass, *Sesbania rostrata*, herb legume and *Leucaena leucocephala*, woody legume (Shu et al., 2002; Yang et al., 1997; Zhang et al., 2001). The selection of appropriate plant species that can survive and colonize metal-contaminated soils is indeed important for successful reclamation of mined sites. *L. leucocephala* had the highest survival rate and grew well in mined-out nickel areas in Surigao. However, there are factors that need to be noted as these influence the survival and growth of the species. In a study conducted by Ssenko et al. (2014), they cited that although the plant grew fastest in untreated pyrite and copper tailings, reaching reproductive maturity in 7

months after planting, the relative growth rates of the species and the other tree species were not significantly different at all sites.

Some woody plants have been regarded to be important in mined area rehabilitation due to their capability to absorb heavy metals. In TMC, *L. leucocephala* and *Terminalia microcarpa* which are both woody species had the highest survival rate. Woody plants may have an advantage in metal-phytoremediation over herbaceous plants (Zhang et al., 2001). In this study, the woody legume *L. leucocephala* grown on the tailings with a topsoil cover of 8 cm was the most dominant species. The combination of fast-growing exotic species, legumes and native flowering plant species is viewed to be essential in initiating ecological succession. Davis et al. (2012) cited that tree and shrub species of lesser commercial value are important to wildlife. Thus, in addition to crop trees, other tree and shrub species should be prescribed for improving wildlife habitat.

3.1 Plant growth

The growth and survival of plants in the agroforestry strips have been promising in the first 2 years. Ipil-ipil (*L. leucocephala*) and rain tree (*S. saman*), which are used generally as nurse trees, have been growing propitiously as indicated by their height and stem diameter (Tables 5 & 6). The selection of these two species apart from their high survival rate in the mined-out area is also based on their high litter production capacity. Both species have higher litter fall that contributes to the organic matter build-up. Species that are tolerant to soils which are deficient in nitrogen and have high littering capacity are good pioneers in mined areas where soil conditions are generally tough. In New Caledonia, fast-growing native species such as *Acacia spirorbis* and *Casuarina collina* are used being nitrogen-fixing species and improve environmental conditions (Sarraiilh & Ayrault, 2001). The behavior of these species has been well known and these can be easily managed from planting to harvesting, so these are the most widely used.

Some species survived in the constructed forest strips, however, the growth is slow. The thin layer of topsoil after backfilling is not sufficient to support the needs of the plants to grow normally and develop. Layering and thickness of the surface soil materials, as well as meso- and micro-topographic variation, are key to the re-establishment and sustainability of forest ecosystems and plant communities (Macdonald et al., 2015). Ipil-ipil (*L. leucocephala*) and mansanitas (*M. calabura*) showed superior performance in terms of plant height and stem diameter over other species planted particularly at the HMC research site (Table 5). At three months after planting, both plants have started to flower and bear fruits which are important characteristics of vegetation for eco-restoration. However, caution has been recommended in using *L. leucocephala* as it is listed as an aggressive colonizer of wastelands and on secondary or disturbed vegetation in Mexico, in the Yucatán Peninsula and in many parts of Asia (Weber et al., 2008). It is even classified as highly invasive (Richardson et al., 2004; Binggeli et al., 1999). Its categorization as invasive is anchored on its characteristic to flower and fruit year-round with abundant seed production, self-fertility, the presence of a hard seed coat, an ability to build up a seed bank, and ability to re-sprout after fire or cutting. Similarly, *M. calabura* can thrive in poor soils and can tolerate drought. Its seeds are dispersed by birds and fruit bats making it a good pioneer plant because rapid spread of the population in mined-out areas is essential to provide ground cover, thereby, conditioning the soil and making it habitable to other plants and animals. Nonetheless, monitoring of the spread of its population is recommended since it has the potential to be an invasive species which may out-compete indigenous plants. Planting different species of plants has been reported to be promising to hasten natural recolonization of the mined-out areas.

Macdonald et al. (2015) cited that combining optimization of stock type and planting techniques with early planting of a diversity of tree species have been recommended to encourage natural regeneration.

4 Conclusion

The role of agroforestry systems has been considered essential in mined land rehabilitation, particularly, in maintaining species diversity. Planting of diverse plant species on the contours of mined lands can initiate the ecosystem restoration process. The relatively high survival of *L. leucocephala*, *P. indicus*, *S. saman*, *M. calabura* and *T. microcarpa* indicated their tolerance to the conditions in the mined-out areas wherein the soil has low fertility and with considerable amounts of Fe and Ni. The species, particularly, ipil-ipil (*L. leucocephala*) and mansanitas (*M. calabura*), have also shown superior growth which qualifies them as good pioneer species. Moreover, ipil-ipil and mansanitas have characteristics to flower year-round that attract pollinators and other herbivores which are important in the ecological dynamics of the developing ecosystem. Incorporation of these plant species in the agroforestry system for mined land rehabilitation is recommended, however, proper monitoring is necessary as part of the mine rehabilitation management.

5 Acknowledgment

This study is made possible with the cooperation of the Hinatuan Mining Corporation (HMC) and Taganito Mining Corporation (TMC). Recognition is also extended to the Mines and Geosciences Bureau of Caraga Region (MGB-13) for facilitating the link with the mining companies and to DOST-PCIEERD for the financial assistance.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Table 1: Percentage survival of tree species planted in the forest strips at Hinatuan Mining Corporation, Taganaan, Surigao del Norte after one (1) year from planting.

Tree Species	Family	No. of Trees planted	% Survival ¹
Calumpit (<i>Terminalia microcarpa</i>)	Combretaceae	32	86.67
Antipolo (<i>Artocarpus blancoi</i>)	Moraceae	49	61.22
Mabolo (<i>Diospyrus philippinensis</i>)	Ebenaceae	28	35.71
Toog (<i>Petersianthus quadrialatus</i>)	Lecythydaceae	16	62.50
Ipil-Ipil (<i>Leucaena leucocephala</i>)	Fabaceae	170	85.71
Rambutan (<i>Nephelium lappaceum</i>)	Sapindaceae	40	0.25
Narra (<i>Pterocapus indicus</i>)	Fabaceae	18	100.00
Sagimsim (<i>Syzygium brevistylum</i>)	Myrtaceae	46	75.00
Acacia (<i>Samanea saman</i>)	Fabaceae	189	73.03
Marang (<i>Artocarpus odoratisimus</i>)	Moraceae	10	80.00
Mansanitas (<i>Muntingia calabura</i>)	Muntingiaceae	52	86.54
Sampalok (<i>Tamarindus indicus</i>)	Fabaceae	51	29.41

¹planted on July 2014

Table 2: Percentage survival of tree species planted in the forest strips at Taganito Mining Corporation, Claver, Surigao del Norte

Tree Species	Family	No. of Trees Planted	% Survival ¹
Calumpit (<i>Terminalia microcarpa</i>)	Combretaceae	202	98.0267
Mabolo (<i>Diospyrus philippinensis</i>)	Ebenaceae	222	78.38
Toog (<i>Petersianthus quadrialatus</i>)	Lecythydaceae	25	48.00
Ipil-Ipil (<i>Leucaena leucocephala</i>)	Fabaceae	55	100.00
Rambutan (<i>Nephelium lappaceum</i>)	Sapindaceae	70	5.71
Narra (<i>Pterocapus indicus</i>)	Fabaceae	23	91.30
Sagimsim (<i>Syzygium brevistylum</i>)	Myrtaceae	43	34.88
Binunga (<i>Macaranga tanarius</i>)	Euphorbiaceae	5	80.00
Acacia (<i>Samanea saman</i>)	Fabaceae	390	90.79
Mansanitas (<i>Muntingia calabura</i>)	Muntingiaceae	53	83.02
Molave (<i>Vitex parviflora</i>)	Verbenaceae	141	94.33
Mahogany (<i>Swietenia macrophylla</i>)	Meliaceae	69	66.67
Guava (<i>Psidium guajava</i>)	Myrtaceae	75	41.33
Vetiver (<i>Chrysopogon zizanioides</i>)	Poaceae	121	68.00

¹planted on October 2014

Table 3: Growth of different plant species in the forest strips at HMC site, Taganaan, Surigao del Norte.

Plant Species	Mean Plant Height and Stem Diameter			
	(1 yr after planting)		(1.5 yrs after planting)	
	Height (cm)	Girth (cm)	Height (cm)	Girth (cm)
Acacia (<i>Samanea saman</i>)	139.5	1.84	159.60	2.11
Antipolo (<i>Artocarpus blancoi</i>)	63.4	0.67	75.90	0.82
Calumpit (<i>Terminalia microcarpa</i>)	46.75	0.77	53.35	1.13
Ipil-ipil (<i>Leucaena leucocephala</i>)	140.8	1.35	198.75	1.95
Mabolo (<i>Diospyros philippinensis</i>)	44.00	1.00	53.45	1.20
Mansanitas (<i>Ziziphus jujuba</i>)	105.40	1.21	120.86	1.56
Sagimsim (<i>Syzygium bravistylum</i>)	5.25	0.74	25.76	1.19
Sampaloc (<i>Tamarindus indicus</i>)	44.20	0.55	60.43	1.01
Talisay (<i>Terminalia catappa</i>)	55.50	0.98	70.87	1.19
Toog (<i>Petersianthus quadrialatus</i>)	50.00	0.86	65.56	1.25

Table 4: Growth of different plant species in the forest strips at TMC site, Claver, Surigao del Norte.

Plant Species	Mean Plant Height and Stem Diameter			
	(1 yr after planting)		(1.1 yrs after planting)	
	Height (cm)	Girth (cm)	Height (cm)	Girth (cm)
Acacia (<i>Samanea saman</i>)	88.55	0.72	104.15	1.39
Calumpit (<i>Terminalia microcarpa</i>)	65.35	0.68	67.90	0.73
Guava (<i>Psidium gaujava</i>)	71.69	0.75	78.75	0.84
Ipil-ipil (<i>Leucaena leucocephala</i>)	118.40	1.23	151.6	1.63
Mansanitas (<i>Ziziphus jujuba</i>)	73.08	0.39	86.77	0.58
Mabolo (<i>Diospyros philippinensis</i>)	32.50	0.63	34.21	0.65
Mahogany (<i>Swietenia macrophylla</i>)	55.13	0.69	56.94	0.83
Molave (<i>Vitex parviflora</i>)	59.29	0.71	64.55	0.94
Narra (<i>Pterocarpus indicus</i>)	50.07	0.54	57.65	0.58
Sagimsim (<i>Syzygium brevistylum</i>)	41.80	0.46	47.50	0.5
Toog (<i>Petersianthus quadrialatus</i>)	33.33	0.46	37.40	0.5

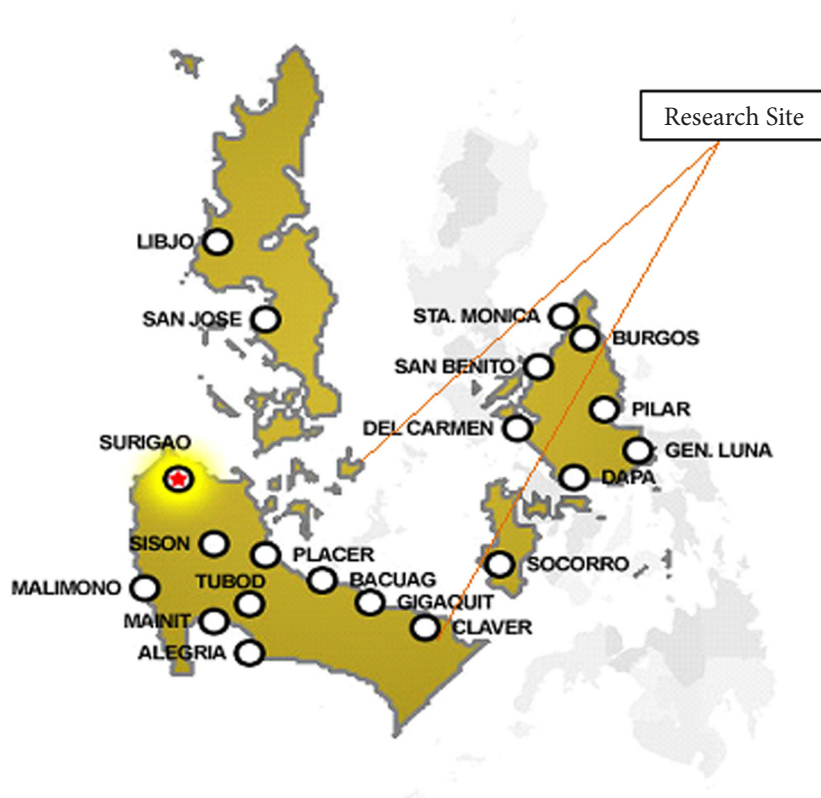


Fig. 1: Map of Surigao del Norte, Philippines showing the Research Site (Source: Province of Surigao del Norte)

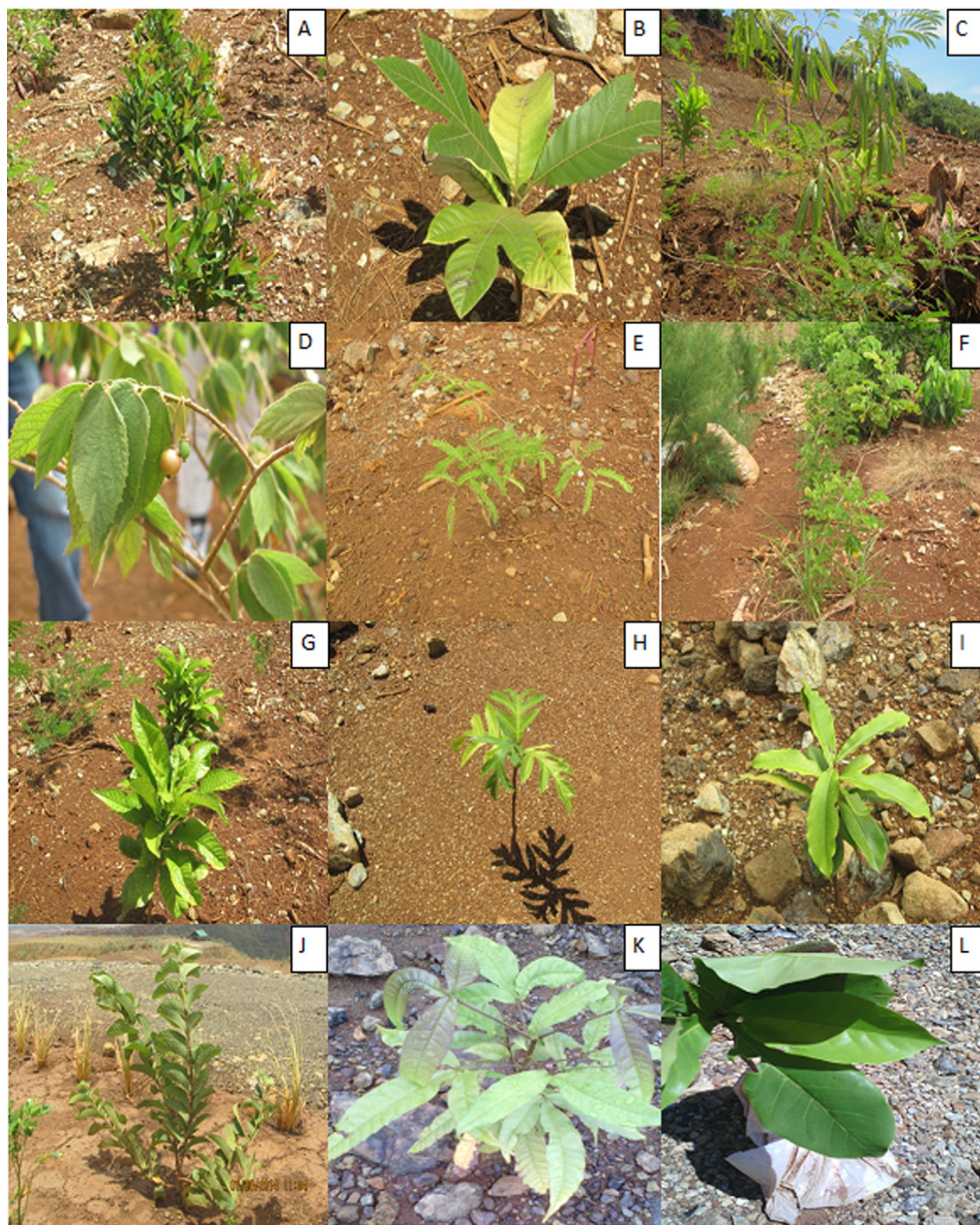


Fig. 2: Tree species planted on the agroforestry strips in HMC and TMC: (A) Sagimsim (*Syzygium brevistylum*); (B) Marang (*Artocarpus odoratissimus*); (C) Ipil-ipil (*Leucaena leucocephala*); (D) Mansanitas (*Muntingia calabura*); (E) Sampalok (*Tamarindus indicus*); (F) Acacia (*Samanea saman*); (G) Toog (*Petersianthus quadrialatus*); (H) Antipolo (*Artocarpus blancoi*); (I) Mabolo (*Diospyrus philippinensis*); (J) Guava (*Psidium guajava*); (K) Molave (*Vitex parviflora*); (L) Talisay (*Terminalia cattapa*).



Parents' Cognitive and Affective Interactions in the Character Development and Aspirations of Children Engaged in Labor in Butuan City, Philippines

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ABSTRACT

This research endeavored to determine the relationship between the parents level of cognitive and affective interactions and the level of personality development and aspirations of children engaged in labor at a certain urban poor area in Butuan City. There were 91 families who were involved in the study. The findings revealed that most of the children are between ages 8-13 years old or at school age and are already engaged in labor. These children have high level of aspirations to someday lift their families from a poverty-stricken life. Their involvement in child labor is a starting point towards this dream. Findings also disclose that the affective and cognitive nature of parents interactions is highly manifested in the households. As a consequence, there is high level of moral and social development of the children. Despite their present economic predicament, they are able to maintain right attitudes towards other children and their elders. They socialize positively with others since they are secured of the love and acceptance of their families. Moreover, children with high level of aspirations tend to have high level of moral and social development. The affective and cognitive nature of parents interactions has significant relationship with the social development of the children. This means that the parents interactions with the children focused more for the development of their childrens life skills than on moral skills. This is particularly due to the aspirations to rise from their present economic desolation.

Keywords: Child labor, Parents affective interactions, Parents cognitive

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1 Introduction

Every child has the right to the most basic necessities in life such as healthy environment, formal education and most importantly, a loving family to come home to. These rights are violated through child labor. Child labor is a condition resulting from the crippling poverty that most urban families encounter (Zulueta & Liwag, 2006). The consequences of child labor on an underage child can be numerous and devastating on his/her physical, mental, and emotional state. It can seriously hamper the well being of a child who is supposed to get a sound education and nutrition to develop into a healthy adult. Flug (1998) posits that due to child labor those children end up being malnourished, weak and suffer from a large number of ailments.

Today, it is observed that hundreds of thousands of Filipino children are deprived of the opportunity to share in the prospects of development. The door of the opportunity is closed on them simply because their "childhood" is wasted in premature work rather than nurtured in school and at play.

In many urban communities in Butuan City, children under 18 years of age are observed to be already engaged in working such a scrapping, selling plastics and bottles for them to earn money to meet their necessities in life. It is also observed, however, that these children are not involved in fighting with other children. Nor are they observed to be shouting at their parents or siblings. This scenario inspired the researchers to determine the possible home factors that may have bearing on children's moral and social development.

2 Theoretical Framework

Maslow's theory (1946) explicitly identifies the basic needs of man such as physiological needs, personal safety, social affiliation, self-esteem towards self-actualization. These needs become the basic source of motivation for every human endeavor. Maslow posited a hierarchy of human needs based on two groupings: deficiency needs and growth needs. Within the deficiency needs, each lower need must be met before moving to the next higher level. Once each of these needs has been satisfied, if at some future time a deficiency is detected, the individual will act to remove the deficiency.

Primary among these needs are the physiological needs which include food, clothing and shelter. Yet many families, especially in urban poor areas are barely able to find opportunities of satisfying these needs. Hence, driven by the nature of these fundamental needs, each member actively participates in the search for the means by which these needs are met.

Self-determination theory (SDT) is a macro theory of human motivation and personality, concerning peoples' inherent growth tendencies and their innate psychological needs. It is concerned with the motivation behind the choices that people make without any external influence and interference. SDT focuses on the degree to which an individual's behavior is self-motivated and self-determined (Deci & Ryan, 2002). It is the determination of the person to meet his/her needs that will drive him/her to act towards the satisfaction of such needs. Such determination motivates the child to participate in the search for an income, no matter how little it might be, so that their basic needs may be met.

In addition, Choice Theory (Glasser, 1948) teaches that outside events never "make" one to do anything. What drive man's behavior is internally developed notions of what is most important and satisfying to him. The internally created notions of how man would like things to be are related to certain Basic Needs built into the genetic structure of every human being. It is by choice that the parents allow their children to develop effective life skills via child labor. They have the notion that meeting the family's basic needs is a shared responsibility of every able member of the household.

Meanwhile, children engaged in child labor have to develop for themselves the appropriate character befitting of growing individuals. Such character in the social and moral aspects are very important lessons that are first taught at home are also taught in schools. The Social Domain theory states that children construct different forms of social knowledge including morality and other forms of social knowledge through their social experiences with adults (parents, teachers and other adults), peers and siblings. Kohlberg's Morality Development theory (1987) states that there a certain period in a child's life wherein his acts, or his perceptions of the morality of an act, are based on the physical consequence/result of the act, not on whether the act itself is good or bad. In this stage, one is motivated by fear of punishment; or one is motivated to act by the benefit that one may obtain later. This has led to the predominant focus of the formative role of parents, peers and social institutions such as schools in the development of moral reasoning development (Holden, 2010).

3 Methodology

This study employed the descriptive research design. It utilized a validated questionnaire to gather the needed data. A Focus Group Discussion (FGD) was also conducted to validate the responses of the children and to gather more salient points about parents' cognitive and affective interactions with their children. The data that were gathered were analyzed with the employment of descriptive statistics and the test of significant differences such as the t-test and Analysis of Variance (ANOVA)

4 Results and Discussion

Figure 1 shows the profile of the children in terms of age. It can be gleaned that the majority of them are in the grade school age. Worthy of notice is that not one of them was below 7 years old. This implies that the preschool-age children are still in the care of the parents at home. In the FGD done with the parents and children, it was gathered that some of these children are in school half of the day and go to vending after their classes. The data shows that the children are of school age of at least in the primary level. There are 17 of them who are aged 7-9 years old. These children are still in Grades 1-3 in the primary level. There are 39 of them who are in the ages 10-12 years old; and there were 35 children in the study who were at least 13 years old.

The distribution of the children according to sex (Fig. 2) shows that the majority (65%) of the children engaged in labor are males. This indicates that the families regard the males as responsible for the livelihood of the families, suggestive of paternal headship in family affairs.

Table 1 shows the data on the level of aspiration of the children engaged in child labor. The responses of the children to the indicators reflect their desires to satisfy their needs of good health, acceptance and being loved by other people. Young as they are, they also want so much to be able to buy what they want. These are expressions of a life deprived of the basic necessities in life. It is their determined aspiration to rise above their present economic desolation.

The home factors that were looked into the study included the parents' interaction with the respondents. The affective nature of parents' interactions pertains to interactions that concerned with rewards and punishments that the parents gave their children. The cognitive nature of parents' interactions relates to those interactions that concerned with advises and admonitions of the parents for their children.

Table 2 shows the level of expression of the affective nature of parents' interaction. The data on extent of expression of the cognitive nature of parents' interaction reveal that the cognitive nature of parents' interaction is highly expressed to the children. The

responses of the children fall into the mean range which indicates that there are some instances when they feel the expression of the affective nature of their interaction with their parents. In the FGD with the children, they claimed that their parents love them. Some of these children, though, find their parents to be inconsistent especially when it comes to punishments. Sometimes, a bad mood becomes the reason for a whip. At other times, simple misbehavior gets a smack or a nag. However, these are a part of upbringing as understood by the children. They love the family, hence, they find it worthwhile to engage in income-generating tasks as an expression of their love and concern for the family.

During the FDG, some of the parents claimed that clear instructions and house rules are set in the family to maintain order and for the children to avoid punishments (Tab. 3). The assistance they could give their children for school work is limited by their knowledge of the subject matter, especially in mathematics. It can be thus said that the children feel that their parents desire for the best to happen for their families. These children, feeling this situation at a young age, are optimistic that someday they will be drawn out from their deplorable situation.

The character development of the children engaged in child labor was categorized into moral and social aspects. In Table 4, it can be noted that most of the children's responses are located in the middle of the three-scaled instrument. The responses to the indicators are equivalent to "sometimes", which just bespeak the kind of moral reasoning of children in their ages. The data also imply that there are times that their actions are borne out of their family orientation (Kohlberg, 1987). It can be recalled that the parents claimed to have given the right directions to their children. Thus, whatever actions and decisions that the children make in particular situations reflect the upbringing practices of the parents. Remarkably, the overall mean response equivalent to "sometimes" point out the fact that the children have a high level of moral characteristics that may be raised to a higher level as they mature and gather more understanding about how life should be lived.

The level of character development in terms of social aspect of the children is shown in Table 5. Most of the indicators fall in the mean range which indicates that the social development of the children is high though they engaged in labor. Children have a good social relationship towards others. They are interested and liked to be friends with others. The overall weighted mean equivalent to sometimes indicate that their engagement in labor had helped them realize some social responsibilities that may be functional as they grow older.

Table 6 shows the result of the analysis of variance in the levels of character development across age groups. The analysis revealed that the social and moral development of the children did not significantly differ across the four (4) age groups. This is evidenced by f-ratios of 1.101 and 2.052, respectively. The significance values of 0.353 and 0.052, respectively, are beyond the 0.05 level of significance set for analysis. Thus, the null hypothesis is not rejected. These results imply that age grouping is not a differentiating factor in the level of personality development of the children. That is, the older ones did not have higher levels of social and moral development than the younger ones. This could be due to their close association with each other whereby they share almost the same experiences which could help them grow along the social and moral aspects of their personalities.

The t-test was utilized to compare the level of character development between the males and the females. The test yielded values which are beyond the 0.05 level of significance set for analysis. This means that the level of personality development of the males did not differ significantly from the females. Thus the null hypothesis is not rejected. This finding implies that the males and the females have almost similar social

and moral skills.

The result of the correlation analysis between the parents' affective as well as cognitive interactions and the level of the children's character development is shown in Table 7. The analysis revealed that the affective and cognitive nature of parents' interactions had a significant relationship with the children's social development. This finding implies that if the children feel the love and affection of their parents, they have the tendency to get along well with others as well as develop social skills that will help them realize their day-to-day goals, regardless of whether these are simpler or complex.

On the other hand, the affective and cognitive nature of parents' interactions did not obtain significant r-values with moral development. This implies that the love and affection of the parents did not have a significant bearing on the moral development of the children.

5 Conclusion

The findings of the study show a typical urban poor community where the children are engaged in the economic endeavors of the family, instead of finding these children in schools or in study centers. Child labor is not a new issue. It is a condition that marks many urban poor families. It locates the children at the center of the situation where they have no choice but to be an active partner in the family affairs; to be burdened by the economic predicament of which they are not supposed to address; to be hostaged by emotional blackmail because they are a poor family.

Surprisingly, the community where the respondents of the study reside seem to remain buoyant despite their depressing living conditions. Parents are still able to provide the affection and love for their children. However, due to the limited time for every child in the family, these interactions are not always encountered by the children. This indicates the passive attitude of parents towards the development of character among the children.

As regards their character development, findings reveal that the children have almost similar views about social and moral development. These children can squarely face anybody without feeling ashamed while scraping, scavenging, or selling bottles because they are proud members of their family. They are underaged but are already resourceful economic partners in the households. Their situation seems dim to outsiders but in the hearts and minds of these children are found the optimism that someday their lives will be better.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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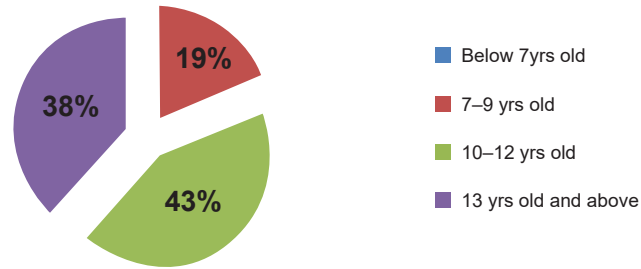


Fig. 1: Age Distribution of the Children Engaged in Child Labor

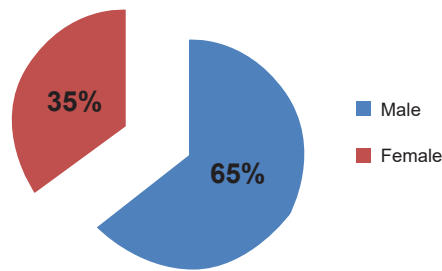


Fig. 2: Distribution of the Children Engaged in Child Labor in terms of Sex

Table 1: Level of Aspirations of the Children Engaged in Labor

Indicators	Weighted Mean	Verbal Description	Interpretation
1. To be a wealthy person.	2.29	Sometimes	High
2. To grow and learn new things.	2.56	Always	Very High
3. To have my name known by people.	2.16	Sometimes	High
4. To have good friends that I can count on.	2.57	Always	Very High
5. To be physically healthy.	2.65	Always	Very High
6. To assist people who need it, asking nothing in return.	2.56	Always	Very High
7. To choose what I do, instead of being pushed along by my life.	2.15	Sometimes	High
8. To know and accept who I really am.	2.52	Always	Very High
9. To feel that there are people who really love me, and whom I love.	2.73	Always	Very High
10. To have enough money to buy everything I want.	2.62	Always	Very High
Overall Weighted Mean	2.48	Sometimes	High

Table 2: Level of Expression of Affective Nature of Parents' Interactions towards their Children

Indicators	Weighted Mean	Verbal Description	Interpretation
1. You have a friendly talk with your mother/father.	2.41	Sometimes	High
2. Your parents tell you that you are doing a good job.	2.34	Sometimes	High
3. Your parents threaten to punish you and then do not do it.	2.22	Sometimes	High
4. Your parents reward or give something extra to you for behaving well.	2.19	Sometimes	High
5. You play games or do other fun things with your mom.	2.21	Sometimes	High
6. Your parents give up trying to get you to obey them because it's too much trouble.	1.96	Sometimes	Very High
7. Your parents hug or kiss you when you have done something very well.	2.05	Sometimes	High
8. Your parents get so busy that they forget where you are and what you are doing.	1.97	Sometimes	High
9. The punishment your parents give depends on their mood.	2.04	Sometimes	High
10. Your parents hit you with a belt, switch, or other object when you have done something wrong.	2.04	Sometimes	High
Overall Weighted Mean	2.16	Sometimes	High

Table 3: Level of Expression of the Cognitive Nature of Parents' Interactions

Indicators	Weighted Mean	Verbal Description	Interpretation
1. Your mother/father helps with some of your special activities (such as sports, boy/girl scouts, church youth groups).	2.29	Sometimes	High
2. You fail to leave a note or let your parents know where you are going.	2.13	Sometimes	High
3. Your mother/father asks you about your day in school.	2.30	Sometimes	High
4. Your mother/father helps you understand about your family's situation	2.18	Sometimes	High
5. Your mother/father helps you plan for the tasks on the coming day.	2.26	Sometimes	High
6. You go out without a set time to be home.	1.91	Sometimes	High
7. Your mother/father talks to you about your friends.	2.09	Sometimes	High
8. You help plan family activities.	2.55	Always	Very High
9. Your mother/father goes to a meeting at school, like a PTA meeting or parent/teacher conference..	2.50	Always	Very High
10. Your parents calmly explain to you why your behavior was wrong when you misbehave.	2.24	Sometimes	High
Overall Weighted Mean	2.25	Sometimes	High

Table 4: Level of Character Development in Terms of Moral Aspects

Indicators	Weighted Mean	Verbal Description	Interpretation
1. If someone gave me too much change at a store and if I knew they did, I tell them.	2.25	Sometimes	High
2. If I see kids fighting and there was no way to call the police, I stop them.	2.28	Sometimes	High
3. I tell a lie so that I can't be punished.	1.53	Sometimes	High
4. If somebody hurts me, I hurt him back.	1.71	Sometimes	High
5. I do good so that my parents will feel good about me.	2.48	Sometimes	High
6. I do household chores because I know it is the right thing to do.	2.51	Always	Very High
7. If I am asked to tell a lie, I could do it to save my friend from a punishment.	1.66	Sometimes	High
8. I can help other people without pay.	2.24	Sometimes	High
9. When my parents told me to buy at the store and there's change left, I return the change to my parents.	2.32	Sometimes	High
10. I tell bad words in some situation.	1.77	Sometimes	High
Overall Weighted Mean	2.25	Sometimes	High

Table 5: Level of Character Development in Terms of Moral Aspects

Indicators	Weighted Mean	Verbal Description	Interpretation
1. I have interest in others.	2.10	Sometimes	High
2. I have the capacity for humor.	2.20	Sometimes	High
3. I expect a positive response when approaching others.	2.33	Sometimes	High
4. I'm not easily intimidated by bullying.	1.86	Sometimes	High
5. I have a positive relationship with one or two peers.	2.30	Sometimes	High
6. I have "give-and-take" exchanges of information, feedback, or materials with others.	2.46	Sometimes	High
7. I was able to maintain friendship with one or more peers even after disagreements.	2.33	Sometimes	High
8. I accept and enjoy peers and adults who have special needs.	2.20	Sometimes	High
9. I like to be named by other children as someone they are friends with or like to play and work with.	2.56	Always	Very High
10. I'm not excessively dependents on adults.	1.89	Sometimes	High
Overall Weighted Mean	2.22	Sometimes	High

Table 6: Analysis of Variance in Character Development across Age Groups

Aspects of Character Development	Source of Variation	Sum of Squares	df	Mean Squares	F	Sig.	Decision
Social Development	Between Groups	0.576	3	0.192	1.101	0.353	Do not reject H_0
	Within Groups	16.741	96	0.174			
	Total	17.137	99				
Moral Development	Between Groups	0.414	3	0.138	2.052	0.052	Do not reject H_0
	Within Groups	6.454	96	0.067			
	Total	6.867	99				

Table 7: T-test of Personality Development between Sexes

Character Development	Sex	N	Mean	SD	t	Sig.	Decision
Moral Development	F	68	2.10	0.259	1.642	0.104	Do not reject H_0
	M	32	2.01	0.266			
Social Development	F	68	2.28	0.420	1.357	0.178	Do not reject H_0
	M	32	2.14	0.409			

Table 8: Correlation Analysis Between Affective Nature of Parents' Interaction and the Children's Character Development

Character Development	Affective Interactions			Cognitive Interactions		
	r	Sig.	Decision	r	Sig.	Decision
Moral Development	0.045	0.659	Do not reject H_0	0.006	0.951	Do not reject H_0
Social Development	0.364**	0.000	Reject H_0	0.349	0.000**	Reject H_0

** significant at $\alpha = 0.01$



On Freedom and Incompleteness: Exploring a Possible Mechanistic Dualistic View of Metaphysical Freedom

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ABSTRACT

In this paper we invoke the notion of incompleteness and examine its connections with the conception of metaphysical freedom, as well as with other consequent and related notions and problems such as the idea of ethical truth. In doing so, we consequently explore a possible mechanistic dualistic view of metaphysical freedom. This paper is divided into three main sections according to the line of discussion we wish to pursue. First, we shall discuss the notion of incompleteness by invoking the idea of incomplete ranking from social choice theory as a starting point. Second, we shall connect the discussions in the first section to discussions on a possible conception of freedom as metaphysically fundamental, which is similar to or and even to some extent related to the idea of consciousness as ontologically basic. Also in this second section, we shall discuss more elaborately the conjecture of a mechanistic dualistic view of metaphysical freedom. Lastly, in the third and last section, we shall discuss some implications of the ideas developed in the first two sections to other consequent and related notions and problems such as the problem of ethical truth.

Keywords: metaphysical freedom, incomplete ordering, positive vs metaphysical freedom, consciousness, dualistic view, freedom and ethics

1 Incompleteness and Metaphysical Freedom

We start with one specific form or aspect of freedom, which is the freedom of choice. It can be asserted that the freedom of choice is one of the most important forms or aspects of freedom in general although conceivably, there could be other forms or aspects of freedom which could also be important. Even then, it can be said that at least some other conceivable forms or aspects of freedom are also inextricably linked to freedom of choice. Both the freedom of thought and the freedom of action, for instance, can be said

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to be to a significant extent dependent on the freedom of choice with regards to how a person can freely choose what to think or do. Also, both notions of negative or positive freedom (or the conceptions of freedom from versus freedom to) directly pertain to the conditions under which the freedom of choice is carried out, whether such freedom to choose is carried out simply in considerable absence of interference or in the presence of certain empowering or enabling conditions. We do not wish to present an exhaustive discussion here but rather, we simply wish to establish that idea or problem of choice is a central problem and a constitutive conception in the discourse of freedom.

When one talks about choice or choosing, one necessarily implies the presence of alternatives among which the choice is to be made. It is also implied that ultimately, the choice that will be made somehow reflects a preference for the best choice available. It is also further implied that the preference for the best choice somehow reflects a ranking or ordering of the alternatives, and such ranking or ordering is based on certain reasons or criteria.

At this point, we now invoke some concepts from social choice theory (a field that combines welfare economics and logical and mathematical techniques, pioneered by the Marquis de Condorcet (1781) in the 1700's, but revitalized in its modern form by Kenneth Arrow (1950) in the 1950's, carried on by Amartya Sen (1970), among others) which we deem to be relevant to the present discussion. Social choice theory is of course concerned with choices at the social or collective level, but as it shall be shown later on, the line of discussion that will be pursued is likewise applicable to choices at the individual level. In a quite simplistic characterization, social choice theory is concerned with how collective choices can be generated from choices of the individuals that compose the collective concerned. The choices or preferences of the individuals usually consist of rankings or orderings of the alternatives available for a particular choice that needs to be made, and it can be supposed that these individual rankings are based on certain individual reasons, motives, intentions, and other influences (Sen, 2002; Sen, 1999). These individual rankings or orderings are then taken into account into a social decision function which stipulates the collective reasons or criteria to be applied in generating the collective choice or in determining the best choice for the collective, which can take the form of a collective ranking or ordering. A complete ranking or a complete ordering is achieved when the social decision function is successful in generating a collective choice (or a collective ranking or ordering).

To illustrate in an example, consider a social choice c that needs to be made by a collective of 3 individuals n_1, n_2 , and n_3 . There are three alternatives to choose from, which are x, y , and z . The individual rankings are as follows: for n_1 , it is $x > y > z$; for n_2 , it is $x > z > y$, and for n_3 , it is $y > x > z$. The social decision function to be employed is the function of majority preference. Given the individual rankings, it can be said that the majority (3 out of 3) prefers x over z , that the majority (2 out of 3, namely n_1 and n_3) prefers y over z , and the majority (2 out of 3, namely n_1 and n_2) also prefers x over y . Thus a collective ranking based on the social decision function of majority preference can be made, which is $x > y > z$, and it can be said that x is the best choice for the collective. Thus, a complete ranking is achieved.

Moving on, we now invoke the notion of incomplete ranking. This happens when the social decision function employed is not able to generate a collective ranking or select a best choice from the alternatives. Consider the same example above, but with different individual rankings as follows: for n_1 , it is $x > y > z$; for n_2 , it is $y > z > x$, and for n_3 , it is $z > x > y$. The same social decision function of majority preference is employed. Given the individual rankings, it can be said that the majority (2 out of 3, namely n_1 and n_3) prefers x over y , that the majority (2 out of 3, namely n_1 and n_2) prefers y over z , and the majority (2 out of 3, namely n_2 and n_3) also prefers z over

x. In this case, there is no best option because if each of the alternatives is considered, there is at least one other alternative that is more preferable than the alternative being considered, based on majority preference i.e. *i*) consider x, but z is more preferable than x, *ii*) consider y, but x is more preferable than y, *iii*) consider z, but y is more preferable than z. Thus, there is an incomplete ranking or an incomplete ordering. This logical impossibility is called Kenneth Arrows impossibility theorem, as described in Amartya Sen's *Development as Freedom* (Sen, 1999). Another impossibility theorem is Amartya Sen's liberal paradox, first discussed in his breakthrough 1970 paper *The Impossibility of a Paretian Liberal* (Sen, 1970). In the liberal paradox, Sen has a stronger claim that there can be no social decision function that satisfies the conditions of minimal liberalism and Pareto optimality at the same time. The type of claim is stronger because Sen not only claims that certain social decision functions do not satisfy the two conditions but rather, that no social decision function satisfies the two conditions. We will not elaborate further on this claim as well as on its logical proof, but the point we are driving at is that incomplete rankings at the fundamental level of logic are present even in the most basic problems of social choice. These problems of incomplete ranking can be readily applied to individual rankings as well by considering conflicting individual reasons, motives, or intentions (which correspond to different rankings) instead of conflicting individuals.

The idea of incomplete ranking, both at the social and the individual levels can be further illustrated in a more practical and less mathematical way. For this purpose, we will just use the same example that Amartya Sen (2009) uses in his *The Idea of Justice*. Consider the choice that needs to be made on to whom among three children, Alice, Bob, and Charlie, should a wooden flute be given. Alice argues that the flute should be given to her because she is the only one among the three who can play the flute (the other two does not deny this) and thus she can make the best use of the flute. Bob argues, on the other hand, that the flute must be given to him because he currently has no toy to play with while the other two have many other toys (the other two does not deny this), and thus he would at least have something and be less deprived if the flute is given to him. Charlie, on the other hand, argues that the flute must be given to him because he was the one who made the flute (the other two does not deny this) and thus he deserves to be given the fruit of his labor. If the decision function that is to be employed is the function to choose the choice that is most just, then it is evident that this could be a practical illustration of how an incomplete ranking can arise. The flute can only be given to one child, and each child provides a compelling reason why the flute must be given to him or her. The reasons are in a sense incompatible with each other, and they are also in a sense incommensurable (*e.g.* Bobs depravity cannot be directly measured or valued in terms of Alices potential productivity or in terms of how Charlie deserves the fruit of his labor).

What can be asserted from the previous discussions is that incomplete rankings are not only possible, they are also ubiquitous. Both individuals and collectives encounter incomplete rankings in all sorts of choices that need to be made. It is of course implausible and even absurd to assert that because rankings among alternatives are often incomplete, that we should evade making choices altogether, because it is impossible to make the best choice anyway. Moment by moment, day by day, choices still need to be made, some with the additional need to be made urgently, and it can be argued that even when the logical or practically rational process of decision making is incomplete, a choice (which preferably can be said to be rational or to some extent still the best choice, but even if it is not) can still be made.

Connecting now the idea of incompleteness with the problem of metaphysical freedom, we start by claiming that there is something to be suspicious about with regards to the freedom versus determinism problem. The primary conundrum is often expressed as

such. There is substantial reason to believe that events in the world are in some sense caused and thus determined. But how can choices be free if they are determined? Thus, one solution that is often defended is the claim that there is space for indeterminism in reality (often in reference to certain ideas from quantum mechanics), and this space makes metaphysical freedom possible. However, as Aune (1985) pointed out in his *Metaphysics: The Elements*, there seems to be a sense of absurdity in supposing that metaphysical freedom is based on a metaphysical notion of indeterminism. Shifting to the first person to illustrate more effectively the reflexivity of an individual subject. If I were suddenly to act or think indeterminately and be conscious of it, it would be difficult to suppose that I would think that I am acting or thinking freely, rather I would think that I am acting uncontrollably. Aune also points out that it is reasonable to think of our free acts or thoughts as to a certain extent determined by our motives, reasons, and intentions. Thus, the notion of metaphysical freedom that Aune advances is metaphysical freedom as the freedom of spontaneity, which is the freedom to intentionally act or think with spontaneity (duly noting that even such spontaneous act or thought is to a certain extent determined by certain causes, such as your motives, reasons, and intentions, whether deliberately considered or not) without significant interference from external or internal forces that can significantly outweigh such freedom of spontaneity.

We therefore work with the premise that metaphysically free acts and thoughts can still be rightfully called as such despite being to a certain extent determined or caused by certain causes or determinants, presumably ones motives, intentions, and reasons. This is Aunes position, which is distinct from both the libertarian and conventional reconciler positions in such a way that it does not necessarily depend either on a categorical conviction on the existence and subjective possession of metaphysical freedom, nor on the stipulation that an act is metaphysically free if the subject or agent could have done otherwise or could have willed to do otherwise. Instead, this notion is initially based on an idea of spontaneity as briefly explained earlier. However, at least in our view, Aunes conception of metaphysical freedom as freedom of spontaneity is wanting of further explanations of specific ways of how thoughts and acts can both be metaphysically free and yet also determined or caused. To address this, we now proceed with some conjectural discussions that employ the notion of incompleteness towards an attempted possible elaboration of how metaphysically free acts can also be determined or caused.

We start with the claim that metaphysically free acts are to a certain extent determined or caused by certain causes or determinants, presumably the subjects or agents reasons, intentions, motives, past experiences, deliberations, predispositions, and other similar possible causes or determinants. As stated earlier, this claim can be reasonably accepted and to a certain extent even said to be evident based on a certain common understanding of everyday human experience. However, based on this same commonsensical understanding, it also seems as though all these determinants and causes are not sufficient by themselves as the complete determinants or causes of a metaphysically free choice. Shifting now to the first person to illustrate more effectively the reflexivity of and individual agent when as an agent I go through the process of making a choice, after which I have made a certain choice, I am conscious and aware that I have just made a choice and that that I have made that choice freely. I am also conscious and aware that in the process of making the choice that I made, there are certain things I considered which I could rightfully pertain to as determinants or causes or influences of my choice, whether I employed a deliberate process of rational decision-making or I simply followed my heuristic impulses. Nevertheless, I can also consciously assert that all these considerations prior to my choice were by themselves insufficient to have caused my ultimate act of free choice. Ultimately, I consciously had to choose and choose spontaneously for my free choice to finally be made.

Referring back to the notion of incompleteness, it can be said that when an agent encounters a situation of incomplete ranking, the situation encountered can be described as a decisional deadlock, despite having considered multiple possible causes and determinants. This situation of decisional deadlock will not proceed towards the achievement of a metaphysically free choice, by relying only on the determinants or causes that are already inputs to the incomplete ranking. Thus, an additional determinant or cause is required to ultimately result to a metaphysically free choice. Our conjecture is that it is free choice or spontaneous choice itself that is the fundamental determinant or cause required to generate a metaphysically free and complete choice from an incomplete ranking or an incomplete decisional deadlock. This conjecture is based on the assertion that causality or determinism does not necessarily entail a singularly linear chain of determinants or causes but instead, there could be multiple parallel causes or determinants, which together comprise the necessary causes and determinants for a certain event to come about. We think this is an uncontroversial and even to some extent unremarkable claim which can be reasonably accepted. Given the conjecture just presented, a potentially plausible explanation on how metaphysically free acts or thoughts can also be determined or caused can be stated. Metaphysically free acts or thoughts are determined because they are caused by multiple parallel causes or determinants, among which the agents motives, intentions, and reasons are included, but most importantly, they are determined by metaphysically fundamental free choices or spontaneous choices, and this is what makes them metaphysically free.

Before proceeding further, a few clarifications need to be made. Of course, it can be called out that metaphysically free thoughts and acts are still possible even in situations wherein a complete ranking is achieved, in line with how it is conceived in social choice theory. This can be accepted as true while still being consistent with the line of discussion being pursued by pointing out that even when a complete ranking is achieved, only a socially or individually reasonable possible best decision has come about, and not yet a metaphysically free thought or act. Even with a complete ranking, the agent may or may not freely choose the best option that has come about. Thus, a broader notion of incompleteness can be invoked in such a way that a thought or act is not metaphysically free and thus in a sense incomplete unless the essential cause or determinant of free choice or spontaneous choice is present to complete the set of necessary multiple parallel (or may also be interlinked) causes or determinants. The idea of incomplete ranking from social choice theory was simply a starting point and initial device employed to make the conjecture we have now arrived at clearer and more apparent.

It can be further called out that there are many other metaphysical events which do not require free or spontaneous choice as a cause or determinant. Again, this is not inconsistent with the line of reasoning being pursued but instead, it is precisely for this reason that metaphysically free thoughts or acts are unique. It is by virtue of them requiring free or spontaneous choice as determinants or causes that metaphysically free thoughts or acts are set apart. In a related note, it can be emphasized further how decisions and choices by themselves are not necessarily metaphysically free. Computer programs and algorithms can generate decisions and choices but because free or spontaneous choice is not present as a cause or determinant, these decisions and choices are not metaphysically free.

2 Free Choice as Metaphysically Fundamental

It appears, at least initially, that the conjecture presented in the preceding section necessarily implies a claim that ascribes a metaphysically fundamental or ontologically basic status to free or spontaneous choice. We would claim that this is not necessarily so, but before attempting to explain why, we would first assert that the claim that free

or spontaneous choice is metaphysically fundamental is not philosophically implausible. The plausibility of this claim can be better appreciated if we start our reflection with our personal everyday experience as human subjects and agents, following David Chalmers (1996) line of discussions on consciousness in his *The Conscious Mind: In Search of a Fundamental Theory*. Shifting again to the first person to more effectively illustrate the reflexivity of an individual human subject and agent as a human subject, there is nothing else that I experience more directly than my own consciousness and thus based on this, as a human subject, nothing seems more real to me than my own consciousness. It also seems that even by raising philosophical or scientific questions in an attempt to understand how consciousness works, I already presuppose myself as a conscious human subject. Similarly, as a human agent who consciously makes free choices in my personal everyday experience, there is also nothing else that I experience more directly than the conscious freedom of the choices I make, and thus in a sense, I constantly and directly experience the reality of my freedom. It also seems that even by raising philosophical or scientific questions of whether I am truly free or not, I already presuppose myself as a free human subject who is freely asking and examining such questions.

What has been said thus far does not necessarily entail that either consciousness or free choice is metaphysically fundamental. They merely imply that there is a strong case for claiming that both consciousness and freedom are metaphysically real, and that it seems as though consciousness and freedom are already presupposed in any attempt to inquire into their nature and mechanisms and they themselves also make such inquiries possible. However, if we are able to come up with a robust and satisfactory account of the nature and mechanisms of either consciousness or free choice, and if such account would entail that either consciousness or freedom is not metaphysically fundamental, then this is to be accepted. However, as Chalmers (1996) asserts, there currently is no robust and satisfactory science of consciousness, particularly one which robustly or satisfactorily explains subjective consciousness in terms of objective physical systems. Thus, there is an explanatory gap between the human subjective or phenomenal experience of consciousness and with the objective scientific models of how the brain or the mind works.

Recent developments in neuroscience are evidently important in helping human beings understand the anatomy of the brain, the mechanisms of brain processes, and their correlative relationships with human behaviors, capacities, and actions. Apart from neuroscience, we have also gained important insights towards a better understanding of how the human mind or brain works from evolutionary biology, psychology, behavioral economics and other behavioral sciences. These different objective sciences of the brain and of the mind have helped human beings come up with strategic interventions both to individuals and societies, towards making human lives better. However, it is a different claim altogether to assert that these objective sciences of the brain and of the mind have provided us with robust and satisfactory accounts of consciousness and free choice as we directly experience them as human subjects and agents. Recent developments in neuroscience have generated comprehensive maps linking and correlating anatomical locations and brain processes with specific functions of the human mind, including decision making and the different states of consciousness (*e.g.* when asleep, when awake, when dreaming, etc.). However, the empirical and mechanistic models of neuroscience does not account for our subjective experiences of consciousness and freedom. It is plausible to imagine brains to continue to be structured and to function as they do, and for human beings to mechanistically act in line with these brain structure and processes, without any human subjective experience of consciousness or free choice. This is what Chalmers (1996) pertains to as the logical possibility of philosophical zombies physical entities which are exact objective duplicates of human beings but without the

subjective experience of consciousness. Given this logical possibility of philosophical zombies, it is also plausible to imagine biological evolution proceeding in line with natural selection, up to a point where human beings (or human-like philosophical zombies) arise, with equal chances of survival within the mechanisms of natural selection, without any need for any subjective experience of consciousness or free choice. Scientific models on the brain and the mind, which are based on externally manifested data on human behaviors, actions, and anatomy, only necessitate that human beings externally appear as if they are conscious and free, but why are they actually conscious and free in their internal subjective experiences? As Chalmers (1996) again points out, this is the hard question about consciousness (as opposed to the easy physical, mechanistic, and empirical questions that the objective neurosciences deal with, with hard and easy being used as a philosophical distinction without the intent to undermine the complexity and rigor involved in the disciplines of the objective neurosciences), and there is currently no robust and satisfactory response to this question, and thus until we come up with a robust and satisfactory science of consciousness, it seems as though the premise that both consciousness and free choice are metaphysically fundamental will remain to be plausible. Chalmers (1996) takes a naturalistic dualistic position on the fundamental nature of consciousness—naturalistic in the sense that he accepts that consciousness is somehow caused by or linked to physical systems such as brains but dualistic in the sense that he maintains that the subjective or phenomenal aspect of consciousness cannot be completely explained in terms of, or completely reducible to, physical systems. Conceivably, a similar naturalistic dualistic position on conscious free or spontaneous choice can be taken, which would be consistent with the line of discussion being pursued thus far.

Earlier in this section, it was recognized that the conjecture on free choice being a separate parallel cause or determinant of metaphysically free thought or action does not necessarily imply that free choice is metaphysically fundamental. This is because even causes and determinants can have antecedent causes and determinants (i.e. caused or determined by something else) and are thus not necessarily fundamental. This realization does not immediately undermine the conjecture on free choice being a separate parallel cause or determinant of metaphysically free thought or action, but it can potentially undermine the metaphysical status of free choice if free choice is metaphysically reduced into more metaphysically real entities, determinants, or causes, particularly when it is metaphysically reduced to the mechanisms of physical systems. However, when a naturalistic dualistic position of conscious free or spontaneous choice is taken, as characterized in the preceding discussions, it can be accepted that conscious free or spontaneous choice is caused by or linked to more metaphysically fundamental physical entities or events, while maintaining that these physical entities and events by themselves are insufficient causes or explanations of conscious free or spontaneous choice. Thus, the concept of incompleteness can again be invoked here and it can be conjectured that there is another metaphysically fundamental cause or explanation for conscious free or spontaneous choice apart from physical systems, and thus the philosophical position on the plausibility of the metaphysically fundamental status of conscious free choice can be maintained.

We think it is also important to mention that not only is there an explanatory gap between the objective science of physical systems and the subjective or phenomenal human experiences, but there are also explanatory gaps among the objective (physical or social) sciences themselves. Within physics, there is an explanatory gap between quantum mechanics which excellently accounts for physical phenomena at the quantum level (at physical magnitudes at the scale of Planck's constant or 10^{-23}) and classical Newtonian mechanics which is still the most robust model of mechanical systems at the macro level. Then there is an explanatory gap on how to account for biological

phenomena (*e.g.* evolution, ecology, genetic propagation) solely in terms of physical and chemical mechanisms. Then there is the explanatory gap on how to account for objective social and behavioral phenomena solely in terms of biological mechanisms. Materialists would maintain that these explanatory gaps are purely epistemic in nature and it is only a matter of time before these gaps are closed, but the fact remains that the explanatory gaps exist now, and the onus is on the materialist to confirm the claim that these gaps can be bridged. Thus, we echo Aunes call out on the apparent implausibility of identifying the probabilistic or indeterministic character of quantum mechanics as the potential locus of the possibility of metaphysical freedom. In attempting to do so, you not only need to bridge the explanatory gap from the subjective and phenomenal to the objective, but you also need to bridge multiple explanatory gaps among different magisteria of objective scientific fields.

So far, what can be called a mechanistic dualistic view of metaphysical freedom has been argued for, with the aid of the underlying concept of incompleteness. In this view, it is accepted that metaphysically free acts or thoughts are caused or determined by, or more conservatively, linked to mechanistic systems. At the level of the thought or act of making choices, these mechanistic systems include the processes of deliberate decision making or the process of coming up with heuristic impulses, which are linked to reasons, motives, intentions, and influences. However, it has been conjectured that this picture of metaphysically free acts or thoughts is incomplete and that there is another metaphysically fundamental and ontologically distinct cause or determinant, which is free or spontaneous choice itself, which makes metaphysically free thoughts or acts possible. It is also recognized that even free or spontaneous choice could be linked to more fundamental mechanistic systems, particularly physical systems such as brain anatomies and processes, but ultimately this account is also incomplete because there is another metaphysically fundamental and ontologically distinct entity which makes the subjective or phenomenal experience of conscious free or spontaneous choice possible. This was developed while duly noting the explanatory gaps between the subjective and the objective, as well as the explanatory gaps among magisteria of objective sciences themselves. This mechanistic dualistic view of metaphysical freedom provides a somewhat richer explanation of how metaphysically free acts and thoughts are truly free and yet determined or caused by various determinants and causes.

Before this section is closed, we think it is important to assert that the mechanistic dualistic view on metaphysical freedom is not a practical shortcut (*i.e.* while the explanatory gaps are not yet bridged, we might as well just temporarily adapt a mechanistic dualistic view of metaphysical freedom), but is a plausible philosophical response to the challenge of coming up with a robust and satisfactory theory of metaphysical freedom. There are certain starting points where theorists can reasonably agree, particularly the fact that subjective or phenomenal experiences of conscious free choices exist and the fact that currently, there are explanatory gaps between the subjective and objective, as well as among different objective sciences. Thus, there is a challenge to theorize about metaphysical freedom given these starting points. The materialist response and the mechanistic dualistic view, among other possible views, are philosophically distinct responses to this challenge which have equal initial merits in attempting to develop a satisfactory and robust account of metaphysical freedom. The mechanistic dualistic view is not a second rate option that is to be resorted to while the materialist view is working out its defense. Instead, it is a direct response to the question of what a theory of metaphysical freedom demands. This clarification is made in analogous reference to a similar clarification that Sen (2011) makes about the comparative approach (an alternative to the dominant transcendental social contract approach) to a theory of justice which he defends in his *The Idea of Justice*. Sen asserts that the comparative

approach is a direct response to the question of what a theory of justice demands and not a practical shortcut that can be adapted in the meantime while various transcendental or social contract theorists have not agreed on what perfectly just social institutions are like.

3 Some Implications of a Mechanistic Dualistic View of Metaphysical Freedom

In this final section, we shall discuss some of the implications of the mechanistic dualistic view of metaphysical freedom, as conjectured and developed thus far, to some important associated notions. In particular, we shall discuss and connect this view of metaphysical freedom to the ideas of ethical responsibility, justice, and human nature.

The connection between freedom and ethical responsibility is of course readily evident. Since a human being is supposed to be an agent who is capable of thinking and acting freely, then the individual human agent is taken responsible or accountable for his or her free thoughts or actions. If metaphysical freedom is not possible because of the essentially deterministic nature of reality, as it is argued in some philosophical positions, then ethical responsibility is also not possible. However, in the mechanistic dualistic view of metaphysical freedom, metaphysically free thoughts and actions are possible and thus, human agents can be taken accountable for their metaphysically free thoughts and acts (Aune, 1986). A human agent is responsible or accountable for his or her thought or act if the choice to think or act as such was chosen freely, that is if the metaphysically fundamental cause or determinant of free or spontaneous choice is present and serves as one of the causes or determinants when the choice is made. On the other hand, if there is an internal or external force which prevents or significantly handicaps free or spontaneous choice from being one of the key causes or determinants of a thought or act, then it can be considered that the human agent is not ethically responsible or accountable for the thought or act. An example of such an internal force would be a mental or psychological illness which severely alters the human agents subjective experience such that his or her ability to employ free or spontaneous choosing in his or her thoughts or actions is significantly handicapped. On the other hand, an example of an external force that could handicap the ability for free and spontaneous choice is extreme coercion. In the mechanistic dualistic view of metaphysical freedom, whether or not a persons thought or act is metaphysically free, and consequently whether or not a person is ethically responsible, is ultimately diagnosed only in the human agents subjective experience. Nonetheless, in objective attempts to determine ethical responsibility, usually at the social level, society can rely on external manifestations of metaphysically unfree thoughts or actions (such as external manifestations of mental illness or coercion that results in handicapped free or spontaneous choice).

In the mechanistic dualistic view of metaphysical freedom, a thought or an act is metaphysically free, and thus the agent is ethically responsible, as long as free or spontaneous choice is one of the causes or determinants of the thought or act. This is an expansive conception, in the sense that there is a minimal (in fact, only one) necessary and sufficient condition for a thought or act to be considered metaphysically free. Such a conception is also focused on the intrinsic capability of the human agent to choose freely rather than on external systemic factors that may significantly influence choice. In other words, regardless of what systemic external factors could have heavily influence the choice that was made, or of how easy or difficult the choice was, or of whether or not the agent could have done otherwise, as long as the choice was made with conscious free or spontaneous choice as one of the causes or determinants, then the thought or action is still metaphysically free and the agent is still ethically responsible. It is important to note

however that an agents thoughts or actions are not solely caused or determined by free or spontaneous choice but also by multiple other causes and determinants, which include motives, intentions, and reasons, which are also further defined and determined by causes or determinants of other kinds. This realization has potentially important implications on an ethical view on just punishment, both in the retributive or corrective sense. On one hand, retributive punishment can be justifiable because human agents can be held ethically responsible for their metaphysically free thoughts and actions, but on the other hand, if an ethical system also aims to focus on the corrective aspect of punitive justice, it is also important to not only punish the offender to discourage or correct his or her propensity to make the same choice in the future (since presumably the undesirability of the punishment done to him or her as well as the undesirability of potentially getting punished again in the future would then be one of the input considerations and thus one of the dominant causes or determinants of future action), but also to address the multiple other causes or determinants of the unethical action. This would be a more comprehensive or complete approach to ethical punishment and justice (Rawls, 2009; Sen 2011).

Elaborating further on some other important implications of the mechanistic dualistic view of metaphysical freedom on the idea of justice, we now proceed to discuss some consequent claims that can be made on what a just society looks like if this view of metaphysical freedom is taken. Because freedom is in a sense considered metaphysically fundamental and constitutive of human subjective consciousness and experience, then the status of individual human freedom could be elevated among other important considerations of justice such as individual and aggregative utility, social ideals and norms, and social contracts and institutions. Freedom can be asserted to be valuable in itself as it is a key cause or determinant of human thoughts and actions and is thus central to human experience in general, but it is also present in conjunction with other determinants and causes and is also dependent on the alternatives that are available in every choice that is made. Thus, it can be said albeit rather impressionistically, that the idea of a just society consistent with the mechanistic dualistic view of metaphysical freedom would be that of a society which promotes rational awareness or consciousness on the expansiveness of the possibility of free or spontaneous choice (i.e. a society that does not deny the existence of choice where it exists, and makes individual members aware and conscious of the presence of such choices). Such a society would also take its individual members ethically responsible and accountable for their free choices, but would also address other causes and determinants which could heavily increase the likelihood of unethical thoughts and actions (such as systemic poverty, deprivation, ignorance, and violence)(Robeyns, 2005; Alkire, 2005). Thus, such a just society would also be committed to the expansion of the available alternatives for individual members to freely and spontaneously choose the lives they value and have reasons to value, and also committed to the removal of barriers against free choice and the expansion of alternatives for free choice. This conception of what a just society would look like is consistent with the capabilities approach of Sen and Nussbaum (Nussbaum & Sen, 1993), and well as with Sens comparative approach to the idea of justice (Sen, 2011).

Lastly, the mechanistic dualistic view of metaphysical freedom also has some important implications on the idea of human nature. Upon some conceptual extension, this view of metaphysical freedom can be consistent with both a purely materialistic conception of human nature as well as with an idea of human nature which involves a non-physical soul or spirit. Both sides would agree with the claim that human consciousness and free choice are to a certain extent linked to (or originate from, or caused by) physical systems, particularly brain anatomies and brain process. Both sides would also be able to recognize the explanatory gap between the subjective or phenomenal human experience

of consciousness and free choice on one hand, and the objective mechanistic models of the physical systems they are linked to on the other hand. However, the strong materialist would argue that the dualism is only an apparent dualism and not a real dualism and it is only a matter of time before scientists discover a material model that would completely account for reality, even for subjective human experience. On the other hand, the strong dualist would maintain that the dualism is real and what accounts for human consciousness and freedom can only be found in the supernatural or non-material realm inaccessible to the strict methodologies of materialist scientific investigations. Some moderate positions, from both materialists and dualists, can claim that the gap between objective models of the world on one hand, and individual human subjective experiences on the other hand, is a fundamental metaphysical or epistemological gap and thus can never be bridged. Despite all of these conceptual extensions, if the mechanistic dualistic view of metaphysical freedom is nonetheless taken, there could be a reasonable agreement that metaphysical freedom is not only possible, but is an essential constitutive element of human nature, and thus must be valued and protected, both in terms of expanding peoples capabilities for free choice as well as in terms of taking them responsible and accountable for their free thoughts and actions.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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The Church in Organized Protest Movements in Agusan Provinces: 1950-2000

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ABSTRACT

The study aimed to describe the role of the church in the organized protest movements in the provinces of Agusan from 1950-2000. It used the historical research design to analyze the primary documents that determined the goals, objectives, and programs of the protest movements. It described the type of organization and membership as well as the type of protest actions articulated by the participants which were validated through an actual interview of the participants. The study revealed that the role of the church was mainly evangelization in the light of its teachings to holistically transform the people into becoming more vigilant to the social issues confronting them. This was supported by the different programs that were the end results of Vatican II concretized in the grassroots level through the creation of the different sectoral organizations. The programs and objectives of these groups affected the peoples' level of awareness that set them in motion to organize and unite to find measures to articulate change. The study concluded that the role of the church to organize protest was to convey to the people of God their responsibility to themselves, their families, and their respective communities. It, therefore, suggested that the church continue to provide a venue for the marginalized people to express their concerns; to keep initiating and supporting programs to mobilize people for social transformation; and to maintain its stand to act as the conscience of the society which should not be misconstrued as meddling in the affairs of the state.

Keywords: protest movements, church, historiography, Agusan, theory of struggle

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1 Introduction

Protest movements arise when there is a profound discontentment with the existing policies and programs of the government and its agencies. Many consider protest actions as an effective means of mobilizing the government to function in accordance with the principle that the government exists for the common good of the majority.

One of the recorded mass protests was the First Quarter Storm that took place from January to March of 1970 (Lacaba, 1982). It was a period of unrest in the Philippines that was composed of a series of heavy demonstrations, protests, and marches against the government. This happened two years before the Philippines was placed under martial law (I.V. Moran, personal communication, February 28, 2001).

At the time of the First Quarter Storm, the province of Agusan and the city of Butuan launched their protest action. Organizing protest was not new to the people of Agusan and Butuan City because, during the Spanish occupation, they launched protests against the Spanish authorities. First was the protest of the Caragans against the local Spanish Administration in the 18th century when the local people were conscripted for the force labor as mandated by the Spanish administration during that time. The people protested against the recruitment because their absence had an adverse effect not only to their respectively family but also to the community since it will disrupt the agricultural production. Second was the support of the Agusanons to the Katipunan Government of Aguinaldo, which led to the hoisting of the Philippine Flag on January 17, 1899 in Butuan (Schreurs, 1991).

Moreover, in the third quarter of the 20th century, there were social action groups that were created to protect the natives of Agusan against the growing changes in the province brought by the logging concessions. The tri-people of the province composed of the Lumads, Muslims, and Christians convened to work towards the preservation of peace as well as their culture not only for Agusan but also for the entire Mindanao. It was at this point that the First Mindanao-Sulu Pastoral Conference (MSPC) was held from November 17 to 20, 1971 to create a church structure in Mindanao and Sulu that would meet the demands of the times (A. Saniel, personal communication, September 4, 2010; Gonzaga et al., 1971). The role of the clergy, the religious, and the laity was clearly defined in the structure of the church to articulate its social teachings. It designed the means on how to educate the clergy, the laity, and the people from all classes of society to become responsible and participative citizens. It was also desired to create a community that would be aware of the social issues to achieve consensus to social actions and to make the church a worshipping and serving community.

The church can often be seen as behind in almost all important events that desire for social changes. This leads one to ask why the church is always behind in movements for change. The presence of the church people in all social actions was evident to the point of putting their lives at risk to seek reforms. This was shown during the local version of the People Power revolution in 1986 when nuns and priests were the rallying force of the people to overthrow the Marcos regime (I.V. Moran, personal communication, February 28, 2001).

The Summary of Human Rights Violation reported that the widespread resistance and protest movements that happened in the province were the response to issues regarding oppression, militarization, and poverty amidst the abundance of resources in Agusan del Norte and Agusan del Sur. Daral (2002) cited that the protest actions in the two provinces of Agusan in the 70's were activated by the issues of poverty, hamletting, militarization, declaring villages as no man's land, unfair labor practices, alienation of the tribal people from their ancestral domain, and the disappearance of villagers. The unrests were caused by the growing disparity between the rich and the

poor, the displacement of the Lumads from their ancestral lands, and the violation of human rights (Lingkod Tao-Kalikasan in the Service of the Human-Earth Community Secretariat for an Ecological Sound Philippines, 1983; Makinasudnong Alyansa alang sa mga Mag-uuma sa Agusan-Surigao, n.d.; Regional Situationer, 1985; Silva, 1979)

Further, in the 1960's, when the farmers of Luzon and Visayas encountered an increasing difficulty in meeting their daily subsistence, Mindanao became the last frontier for migration. Thus, the tribal people were forced to share their lands to the migrants. As the migrants increased in number towards the 70's, the issues of unclear description of the forest zone and the domainable lands emerged. The Lumads lost some of their ancestral domains and were pushed farther to the hinterlands. It was during this time that land grabbers, logging concessionaires, and multinational agribusiness victimized the tribal people. The natives experienced humiliation of their culture and eventually lost their means of livelihood (Boudreau, 2001; Philippine Repression and Resistance, 1981; Tri-people Consortium for Peace, Progress, and Development of Mindanao [TRICOM], 1998).

Poverty then became prevalent and the living conditions of the people were rapidly deteriorating. Philippine Repression and Resistance (1981) reported that people in the urban areas had difficulty in making both ends meet because they were not receiving the minimum wage as required by law. According to the National Statistical Coordination Board (2013), Agusan province belonged to the top 40 poorest provinces in the Philippines. The poverty incidence triggered some social problems such as oppression, violation of basic human rights, and growing malnutrition.

The Task Force Detainee of the Philippines [TFDP] (1999) reported cases of human rights violations against the political detainees in some parts of the Philippines. These situations were also evident in Agusan del Sur and in some areas in Butuan where reports of widespread village massacres, hamletting and villages declared as "no man's land". These situations were brought about by the massive militarization in the Agusan Provinces.

Church groups like the Mindanao-Sulu Pastoral Council and Social Action Group were organized to respond to the social issues prevalent in the Agusan province. Nuns, priests, pastors, and lay ministers became the defenders of the rights of the people. These church leaders stood up for their advocacy as defenders of people's rights because they themselves were victims of abuses. It was not unusual to hear accusations that the church intervened in the affairs of the state and was regarded as subversive by the government. In fact, in 2005, the police raided the convents of the Missionary Sisters of Mary and the Religious of the Good Shepherd in Butuan City because they were suspected to be supporters of the rebel group.

The research environment of this study is the province of Agusan which is a part of Region 13 known as the Caraga Region (Fig. 1), located in the Northeastern part of Mindanao. Caraga Region is composed of four provinces, namely: Surigao del Norte, Surigao del Sur, Agusan del Norte, and Agusan del Sur. Agusan del Norte has a land area of 2,590.3 square kilometers, encompassing 12 towns. Its capital is Butuan City. It is bounded by Surigao del Norte in the North, Surigao del Sur in the East, Misamis Oriental in the West, and Agusan del Sur in the South.

Agusan del Sur on the other hand has a land area of 8,965.6 square kilometers; Agusan del Sur, with 14 towns. Its capital is Prosperidad, known as Baba by the local people. It is bounded in the North by Agusan del Norte, in the South by Compostela Valley, in the East by Surigao del Sur, and in the West by Bukidnon and Misamis Oriental.

During the Spanish occupation in the Philippines until 1911, Agusan was part of Surigao, known then as Caraga District. In the same year, the Philippine Assembly

formulated Republic Act 1693 which created non-christian provinces because there were many tribal people who were not yet converted to Christianity. Thus, Agusan was separated from Surigao. In June 1967, Philippine Congress approved Republic Act Number 4979. The law divided the provinces into Agusan del Norte and Agusan del Sur which took effect on January 1, 1970.

Majority of the Agusanons use Cebuano as their medium of communication, but some tribal people take pride in using their native dialect. About 1.5% speaks Tagalog, although a good portion of the population understands and communicates in Tagalog. Majority of the people in the province speaks English. Its population is 89.9% Roman Catholic. Other religions include United Church of Christ in the Philippines, Iglesia ni Kristo, United Church of the Latter Day Saints, Jehovah's Witnesses, and Islam. Prevalent in the province are several cults whose members consider them as their religion.

This study aims to document the events in Agusan during the protest movements. Most of the documents on protest movement were destroyed by those who possessed it to avoid implications of being subversive. The researcher felt the need to get the data of these incidents from people involved in the protest movement who are still available to tell what really transpired in the province of Agusan from the martial law to the post martial law eras. Likewise, this study aimed to let the people understand and appreciate the role of the church in Agusan during those period wherein several protest were articulated in order to end the martial law era. This study could provide information on the true state of the province of Agusan from the 1950's at the height of the logging industry to year 2000 when Agusan was listed as number 44 among the poorest provinces in the Philippines.

2 Theoretical Framework

This study is anchored on the theory that social justice is an integral part of evangelization. Human dignity is at the heart of church teachings. Filipino theologians called the theology in the quest for justice as the "theology of struggle," which aims to improve the social conditions of the people as reflected in *Vatican II*, in the five great encyclicals, and in *Justice of the World*. (Youngblood, 1990)

Pope Leo XIII's *Rerum Novarum* (1891) maintained the idea that the church speaks out on social issues to teach the correct social principles and ensure class harmony. It pointed out the economic and social conditions of the working classes and suggested the formation of trade unions and collective bargaining agreement between the employers and employees. It further helped to understand that the church is not supporting the communist idea of no private ownership or the concept of the socialists that the state must control the means of production. It furthermore stressed that the essential reason for those who engage in gainful labor undertakings is to satisfy the basic needs, procure properties, and retain them by individual rights as their own.

Forty years after the release of *Rerum Novarum*, however, Pope Pius XI issued the *Quadragesimo Anno* on May 15, 1931 when the world was in the state of economic crisis. *Quadragesimo Anno* supported *Rerum Novarum*, but it emphasized the demands brought by political and economic changes of the times (XI & Lieshout, 1931). It further pointed out the economic system of the period and how it divided society into two classes. The first class referred to those who had all the material wealth while the second classes were those who did not have the wealth which constituted the working men. Those who were less fortunate were oppressed by poverty and struggled to escape from the plight. Such conditions prompted the church workers to look for solutions, and the encyclical letter taught human kind new approaches to social problems.

In response to Popes Pius XI and Leo XIII's encyclicals, upon its establishment in 1967, the Diocese of Butuan/Agusan introduced the Social Action which was among its

first apostolates. Commitment to social action within the Catholic Church was reflected in the encyclical letters, the *Rerum Novarum* (Pope Leo, 1891) and the *Quadragesimo Anno* (XI & Lieshout, 1931) (I.V. Moran, personal communication, February 28, 2001).

The policy changes advocated by Pope Paul VI in 1960 indicated a shift in the social action orientation of the Roman Catholic Church and the Protestant Churches in the Philippines. Emphasis on social justice as an integral part of evangelization received attention in all religious sects. Encyclicals such as *Pacem in Terris* and *Mater et Magistra* by Pope John XXIII; *Populorum Progressio* by Pope Paul VI (1967), and the other encyclicals by Pope John Paul II, together with the documents the Second Vatican Council produced in 1962-1965 and several synods and convocations of bishops have all underscored the Catholic church renewed commitment to human rights freedom and social justice (Catholic Church, 1961; Pope, 1967; Terris, 1963; Youngblood, 1990).

On the other hand, Pope John XXIII's *Mater et Magistra* and *Pacem in Terris* called for involvement in human development and social changes. The Second Vatican Council meeting in October 1962 encouraged the involvement of priests in social action and justice. Liberation Theology in Pope Paul VI's *Populorum Progressio* looked into the inequitable distribution of wealth as the reason for misery and oppression of the poor and stressed the importance of people in taking control of their own destiny (Flannery, 2001; TFDP, 1999).

Human dignity is at the heart of church teachings. According to Pope Paul VI (1967), the Church has 2 functions in society: (1) to enlighten people to understand the truth and to find the right direction to follow and (2) to make people participate actively and effectively in the transformation of society since the church denounces injustices. On the other hand, on July 9, 1970, the Bishops of the Philippines issued a statement which defined their role in moral leadership, signifying their stand to fight for injustices and denounce the evils of society (Fabros, 1988).

The *Justice in the World*, product of the World Synod of Catholic Bishops in 1971, explained why the church considered her role in providing justice and spiritual/moral teaching to humankind (Bishops, 1971). It also explained that violence and oppression contradicted the plan of God and because of this, the church took it as her task, through the gospel, to put morals in the actions of humankind. Furthermore, the church's mission to redeem the human race and liberate people from oppressive situations was within church teachings.

Moreover, the United Church of Christ in the Philippines (*UCCP*) worked against oppression and violations of human freedom. In his speech during the Golden Jubilee of Cosmopolitan Church in 1983, Narciso Ramos, one of the founders of the church, cited the historical and nationalistic implications of the separation of the UCCP from the Methodist Mission Board in 1933 :

"Those who walked out not only staged the protest against immorality and injustice but made history in the religious evolution of the Filipino people. It marked the beginning of an indigenous Protestant movement in the Philippines, which added meaning to the political emancipation of our country." (Cosmopolitan Church, n.d.)

Since its foundation, the UCCP took on a prophetic ministry that was political in nature, displaying love for God and country. This endeavor continued long after the liberation, seeing itself at the forefront during the Martial law era in the 70's and went on in a span of 56 years wherein the thrust of the Church was on good governance. The Church continued to strengthen individuals towards spiritual maturity and its leaders called on its members to go back to their heritage to liberalize spirituality where the leaders envisioned it to be a catalyst for social transformation and liberation, having

a preferential option for the poor and the victims of injustices (Cosmopolitan Church, n.d.).

In the bulletin *Power and Ecumenical Movement in the Philippines*, George O. Buenaventura mentioned that the idea of the Filipinos towards mass movement was called the power from below. It featured protest actions of the country spearheaded by the church leaders and wrote:

Both revolutions were ecumenical. Christian churches, schools and institutions, as well as Muslim communities joined the rally for the ouster of two popular presidents of the country. In our common desire for justice and peace, our ecumenicity was exercised. In the people's search for freedom and fullness of life, power from below which I consider as 'the foundation power' shakes the whole structure and subverts conventional ways of seeing and living. "God drags strong rulers from their thrones and puts humble people in places of power" (Luke 1 : 52, CEV) (Buenaventura, n.d.).

In his book, *Marcos Against the Church*, Youngblood (1990) cited the deliberation of *Vatican II* and the International Catholic and Protestants convocations to have a profound effect on Philippine churches but had contributed to increasing church-state conflict during the Marcos regime. The Church that emphasized social justice contradicted the development programs and national security concerns of the Marcos government. This only showed the unity of the religious organizations in working towards a common aspiration and in preserving human dignity and social justice.

On the other hand, the clergy created activities patterned after the development of the revolutionary movement in Nicaragua. Similarly, church workers also became the forerunners of the reform movements. They encouraged the creation of social action centers and made the focal point to demand reforms from the Marcos government. Protests in seeking reforms came in different forms such as rallies, strikes, prayers, candle lighting, and propaganda (TFDP, 1999).

There were instances that, out of frustration, people made use of other means to articulate change by creating underground movements which became widespread in the province. Some of the clergymen went underground. Some of them, however, returned to the preaching profession while others remained missing that nobody could tell their whereabouts.

In its articulation of the protest movement, the major role of the Church can be summed up in three P's: *Pera*, *Printa*, *Pagkain* (money, printing, and food). The Church had the means and capacity to provide the three P's for the movement to function. The clergy, however, encountered problems such as tribal disunity and reconciliation of the interests of the Christians in the lowlands and the interests of the Lumads in the hinterlands. There was also the call for cooperation of the tri-people (the Lumad, the Christians in the lowlands, and the Muslims) in the province.

Dissatisfaction was one of the causal factors of protests. There were times that the labor sector of the provinces of Agusan hesitated to participate in protest movements because the participation of the people in such would mean losing their jobs. People valued so much whatever work they could have because there were very few job opportunities in the province.

This study focused on the protest movements in Agusan province and the role the Church played in protest actions. It is limited to the year 1950 to 2000, as the province of Agusan had its economic prosperity in the 1950's. The five decades provided a thorough background of the development of the province of Agusan. The following groups were identified to have participated in the protest actions such as the Justice and Peace Groups (JPAG); Surigao-Agusan Workers Solidarity (SAWS); Task Force Detainees

of the Philippines (TFDP); Center for Research of the Peasants Services (CROPS); *Kilusang Mayo Uno* (KMU); League of Filipino Students (LFS); Promotion for Church People Response (PCPR); *Babae Kaniadto ug Karon*; Women for the Ouster of Marcos, and *Unyon ng mga Manggagawa* (UMAN). These groups represented the labor, students, and youth, church and human rights advocates.

The role played by the church in the protest movement in Agusan Province is being deliberated in this study in the light of the Vatican documents and liberation theology in relation to the socio-economic condition of the Agusan Province. As illustrated in figure 2, the Church involvement as the dependent variable can be affected through these two independent variables.

3 Research Design and Methodology

The study used the historical research design to determine the development of the protest movements in the province of Agusan. It further sought what occurred in the past to have a better understanding of the role of the church in the protest movements and an appreciation of what transpired in the past that could be attributed to what is enjoyed or suffered in the present.

In order to facilitate the collection of data, the researcher used two (2) interview schedule. One (1) was for the non-clerical participants and observers of the protest movements; while another set of interview guide was used, for the participants and observers in the protest movement. These tools were translated in the vernacular.

The researcher gathered all the documents of the events and development of the protest movements from the organizers of the movements, the Social Action Center of the Diocese of Agusan and Butuan. She also interviewed the leaders and participants of the movements who provided vital information that enlightened her to understand why such protests took place in the province of Agusan.

There were some problems encountered in the collection of data that hindered her from finishing the research promptly. The documents on protest movements from 1950 to 1970 were rare because there were only few incidents of protest action during those years. Likewise, the documents on protests against the Marcos regime were destroyed because they were considered subversive. She also had difficulty in interviewing the sisters of the Missionary Sisters of Mary and the Religious of the Good Shepherd after local police raided them in 2005 on the grounds of giving support and protection to NPA members.

4 Discussion

4.1 Protest Action in the Context of Theological Perspective

In the 1960's, the role of the clergy towards the congregation took major changes. From ordinary evangelization and establishment of settlement done by the early Spanish missionaries, the church anchored its actions and programs basically on the Second Vatican Council, Encyclicals, and documents of the Synod of Bishops. Church people based their involvement in contemporary social issues from these documents.

The Church of Mindanao initiated to popularize many of the currently acceptable theological concepts and pastoral programs. Bishop Carmelo F. Morelos (personal communication, September 4, 2010) explained that this was because most of the Catholics that settled in Mindanao were migrants, who had the tendency to look towards the future; thus, they were receptive to change for the betterment of their lives. On the other hand, Gaspar (1997) added that the church of Mindanao was the first to set up the Basic Ecclesial Communities (BEC) that spread throughout the region and became

an instrument to mobilize people in the articulation of justice and peace issues during the martial law regime. The creation of the BEC had its roots in Vatican II, reflected on the March 26, 1967 *Populorum Progressio* of His Holiness, Pope Paul VI. This encyclical called for the people to be sensitive of the needs of their community and to be duty bound to promote solidarity for the benefit of every member of the community.

Since it was easier for the church workers to create small groups among the masses that later transformed into grassroots movements, BEC members were the common people. Furthermore, Pope Paul II expressed the idea of creating a new structure in the church that would meet the modern demands of the people. The same encyclical maintained that the development of people lies in the spirit of solidarity.

It was the BEC that condemned the implementation of martial law by President Ferdinand E. Marcos and publicly requested to end it. The Mindanao Church, on the other hand, initiated the development of a program to respond to the issues of society's marginalized sectors that included the peasants, fisher folks, workers, urban poor, the Lumads, and the detainees; among those who became famous was Karl Gaspar. Gaspar pioneered the concept of becoming the Church of the Poor and the oppressed. Because of this, most of the community-based action programs were focused on the poor and the oppressed. Hence, the different sectoral and pressure groups, created during this decade, focused on the needs of the marginalized sectors. These groups became the instruments for the people to be more articulate in expressing their desires and aspirations as a community. Their action programs, however, need not be political.

C.F. Morelos (personal communication, September 4, 2010) cited the role of the church in the articulation of social issues based on the precept of reservation of human life and human dignity, not on political aspects, especially on partisan politics. Accordingly, the church based its involvement in Vatican Council II where the church people were the members of the same human family. Because of this, everyone had a shared responsibility to one another of giving love and promoting equality. That is why the church believed that poverty and the absence of a venue for ordinary people to participate in the affairs of their community kept them from attaining their basic and civil rights (Gaspar, 1997).

Unless they will serve first the people of God, the clergy and the church leaders cannot lead the people and be servants of Christ. They have to know the people and act as ministers of God's word. Furthermore, Synod of Bishops (1971) maintained that the church not only preached conversion to God, but also acted as the conscience of humanity.

On the other hand, the Bishops, as leaders of the diocese, looked at the Church of Mindanao as one that acted in unison and promoted plans to develop the level of awareness of the people and elicited responses to the prevailing social issues.

During the 1971 Constitutional Convention, the Bishops of Mindanao and Sulu came up with a pastoral letter encouraging people to respond to concerns, deliberate their responsibilities in their respective communities, and determine their part in human development. Moreover, the church sought answers from the new structure of the churches of Mindanao and Sulu that led to the organization of the first Mindanao-Sulu Pastoral Conference (MSPC I), and the formulation of the guidelines for the building and growth of a Christian Community in Mindanao-Sulu (Gonzaga et al., 1971).

In the conference, the Basic Ecclesial Community (BEC) was one of the proposed programs in creating a basic group that would allow people to develop the concept of *conscientization*. In the same manner, it became an instrument of coordinating faith-response in the lower level, which provided bible reflection sessions and training seminars for social awareness. These growing consciousness and social awareness made people become more articulate and vigilant of the actions and programs of the government.

When government programs failed to alleviate poverty, unemployment, and agrarian

issues, the Church responded by creating the Social Action Center, which was primarily a social organization for the educational formation of the people and leaders of the community, geared towards total and integral human development. Social Action Center activities included the promotion of farmers and workers' union, self-help organizations, small scale industries, housing development, and urban-slum renewal (Bishops, n.d.). These activities were the same social issues reflected in almost all the sectoral organizations created in the height of the Martial Law era.

The Social Action Center of the Diocese under the management of Fr. Antonio A. Saniel ceased operating in the middle of 1980's because of the difficulty in obtaining funds from Germany; in the late 1990's, however, the Missionary Sisters of Mary revived it in the late 1990's. MSPC I focused on community development and the creation of a new church in Mindanao and Sulu; MSPC II of 1974 faced the martial law era; hence, issues such as militarization, oppression of the Lumads, harassment, and other human rights violations were discussed. As a result, the representatives proposed the creation of a support group to the grassroots movements (farmers, laborers) which should come from the marginalized sectors. The grassroots movement became a part of the program known as "building self-sustaining communities" to make people cooperate in building their community as part of their responsibility to others. Likewise, it promoted people's autonomy geared towards a self-governing community so that people would not rely on the assistance from the government (C.F. Morelos, personal communication, September 4, 2010).

In the 1977 MSPC, Bishop Carmelo F. Morelos stressed for the strengthening of cooperation and coordination among the people. The conference proposed that the church establish the different related and/or satellite programs, like Alay Kapwa, that emphasized the sharing of one's treasures, and the Conference on Justice Development that aimed to form right attitudes toward the Muslims and cultural minorities and to involve these communities to help conscientize their own people. In addition, Morelos explained that in connection with the conscientization programs, the diocese created an office to aid the Lumad communities that facilitated the alliance of all cultural communities. Furthermore, the Community Based Health Program was also introduced to cater to the health needs of the rural people from available local community resources. The issues discussed in the MSPC's were still related to the hindrances of the people to attain development due to martial law. This was the reason why the 1980 MSPC publicly renounced the martial law regime and called for President Marcos to lift it (Bishops, n.d.). Since its formation in 1971, the MSPC continued to meet every three years, with Butuan having its share of hosting the event in 1989. During this conference, the discussions gave emphasis on the BEC, called the evangelizer toward the year 2000 (Bishops, n.d.).

It is worth noting that, in October 1962 after the Second Vatican Council, there was a change in the attitude of the church towards social issues as it encouraged the involvement of the priests in social action and justice. The encyclical letter *Pacem in Terris* of Pope John XXIII in 1963 advocated for change and called for church involvement in human development and social justice. Pope John XXIII's teachings on World Peace stressed that every individual is a person with rights and duties. The Pope stressed that, to be well ordered and productive, human society must consider every human being to be endowed with intelligence and rational mind to make him/her capable of self-determination. He also added that people must enjoy their economic and political rights, be given a decent job and just wages to secure his/her own life and the lives of his/her family.

In relation to the economic rights of every individual is the right to one's property and production of goods. Pope John XXIII believed that these rights would strengthen family life which would result in peace and prosperity for the state. Moreover, the

same encyclical letter revealed that the dignity of the human person includes the right to participate in the affairs of the state and in the decision making process of the government.

The 60's was the time for the active involvement of the church to social issues because of the conceptualization of Liberation Theology which the Filipino theologians called the Theology of Struggle that revoked political repressions. Adapted by the Filipino theologians, the concept promoted deeply the issues on political repression and human rights violation. This was inculcated in the minds of the theologians after the Synod of Bishops in 1971 that produced the document *Justice in the World* and declared the actions for justice and participation in the transformation of the world as a constitutive dimension of the preaching of the Gospel of the Church's mission for the redemption of the human race and its liberation from oppressive situations. Furthermore, it renounced the unjust system and the restriction of the rights of individuals as a contradiction of the teachings of Christ. Moreover, it also demanded for a unity of purpose by the world society of human beings for advancing towards a more humane society where the present situation is viewed in the light of faith. In this sense, the church involvement to renounce the evils brought about by the martial law regime was a gospel-based action. The programs the MSPC proposed defined the extent of the church involvement parallel to what was proclaimed in the document *Justice of the World* (Bishops, 1971).

In addition, the encyclical *Populorum Progressio* provided a scheme on how the church people must work towards the development of people. Pope Paul VI (1967) enunciated the need to be aware of the miserable condition of the poor, the oppressed, and those whose rights had been violated or curtailed to make the church people respond to the needs of their fellowmen. The encyclical pointed out the roles of the church to the world and of the early missionaries in spreading the works of Christ, and the duty of the present generation of promoting and preserving what the early missionaries had achieved. It also called for solidarity in facing the social issues such as war against hunger, violence, materialism, racism, and division of people. Thus, *Populorum Progressio* called people to be the apostles of development. Because they articulated the social issues, leaders and workers were accused of supporting the leftist group. Based on the teachings of the gospel, the Church always advocated non-violent means in seeking for reforms (Pope, 1967).

Moreover, in his 1891 *Rerum Novarum*, Pope Leo XIII abhorred the application of the ideologies the leftists were advocating. He renounced the socialist concept of achieving equality between the rich and the proletariat by doing away with private possessions. He questioned the Marxist theory that revolution is caused by economic instability and the dissatisfaction of the people to attain material possessions, and did not support the communist's ideology of the state in controlling the factors of production, but considered the condition of the working classes in the light of benevolence. Furthermore, *Rerum Novarum* proposed to the government to create programs to protect the laborers by giving sufficient wages and excellent benefits that are tantamount to equitable division of goods. The dissatisfaction of the workers resulted to strikes and rallies that caused upheaval in trade and commerce and in the general interest of the state.

Although Catholics started the movements to articulate the desired reforms, the Protestants, Muslims, and members of other religious affiliations joined and participated in the call for reforms. Vatican II encouraged ecumenism and collaboration at all levels. The November 1972 ecumenical commission meeting concluded that it is at the level of the local church that the spirit of ecumenism must find concrete expression. Because of this, the diocese of Butuan started to hold ecumenical masses celebrated mostly in public grounds (TFDP, 1999).

The ecumenical movement gained its momentum in the martial law era. Several

movements were created to respond to certain prevailing issues that developed into a partnership of the different sects. Theology Instructor Ella Mae Romano (personal communication, September 11, 2010) identified the Justice and Peace Group (JPAG) supported by the social action center which called for the release of political prisoners and finding of the victims of salvaging. On the other hand, the United Christian Church of the Philippines (UCCP) became a partner of the Catholic Church in supporting protest actions. The collaboration resulted in the creation of the Church Military Liaison for the Diocese of Butuan to become an instrument in expressing issues with the Catholics, the Aglipayans, and the Protestants. Likewise, the Association of Major Religious Superiors of the Philippines established in 1974 the Task Force Detainees of the Philippines (TFDP) to provide moral and spiritual support to political prisoners and work for their just trial and speedy release (TFDP, 1999).

Buenaventura (n.d.) commented that, in the Philippines, power and might can be challenged peacefully through courageous and organized ecumenical movements. The history of the Philippines proved that people from all walks of life were able to topple down two popular and powerful leaders in the cases of Presidents Ferdinand E. Marcos and Joseph Estrada.

In its 97 years of existence, the UCCP whose thrust is on good governance maintained its work against immorality and injustices, and envisioned to create a church to be a catalyst for social transformation and liberation (Cosmopolitan Church, n.d.).

Finally, the role of the church to organize protest movements was mainly on logistics that involved the support of the three P's - *pera*, *printa*, *pagkain* (money, print, and food). The grassroots movements articulated by the common people were in dire need of resources in which the church provided the linkages with other partners. Material assistance, however, was not sufficient without the moral and spiritual support of the church clergy and leaders. In fact, violence by the authorities was thwarted because of the mere presence of the clergy, the nuns, and the church workers and this will always remain the duty of the church to protect its flock (C. F. Morelos, personal communication, September 4, 2010).

4.2 Collaboration between the Church, the Government, and other Stakeholders

In order to respond to the needs of the entire Mindanao Island, church leaders constantly conceptualize programs. But the biggest problem of Mindanao is to bring about peace and solidarity among the Muslims, Christians, and Lumads or the Tri-people. Almost every Mindanawon believed that, unless peace and security issues would be first solved, there would be no concrete solutions to the social problems in the island.

The promotion of Muslim-Christians dialogue and tri-people movement for solidarity was a significant measure to bring about peace in the island. Because of this, in 1996, the Bishops-Ulama Conference (BUC) was created; since then, it has been spearheading community consultations and dialogues. Among its adopted programs is the yearly weeklong celebration of Mindanao Week of Peace (MWP) every last week of November to December 1 (C. Clase, personal communication, October 18, 2011).

Mindanao Week of Peace (MWP) started as a local celebration in Zamboanga City initiated by the Peace Advocates of Zamboanga City or (PAZ). PAZ was headed by Fr. Angel Calvo (Claretian). In 1999 recognizing the importance of the celebration, BUC adopted it for the whole Mindanao. The MWP is a celebration of ecumenical prayer among the TRI people, dialogue between the different sectors of society, and other pertinent activities that are significant to respond to issues of the community. Despite being subjected to several prejudices and mixed feelings of the Mindanawon who were

exasperated with the constant war and bombing in Central and Southern Mindanao, several towns and parishes joined the celebration (C. Clase, personal communication, October 18, 2011).

The Bishops and Ulama of Mindanao anticipated that MWP may promote people awareness of the need to work together to attain peace in the entire island. The MWP became a venue for the different sectors such as the academe, media, religious leaders, senior citizens, youth, government officials, NGO's, military, PNP, MNLF, MILF's and others to meet together, discuss, and respond to issues so as to find solutions, if not to alleviate them (C. Clase, personal communication, October 18, 2011).

The effort to bring all the sectors of society in one forum caught the attention of the government. Because of this, in November 26, 2001, President Gloria Arroyo signed Proclamation Number 127 which superseded Proclamation Number 408, dated November 3, 2000. Hence, under Proclamation No. 127 all concerned government agencies and instrumentalities including government owned and controlled corporations and members of the private sectors and civil society based in Mindanao are encouraged to participate in MWP.

In cooperation with the BUC in Agusan and Father Saturnino Urios University, the Diocese of Butuan started celebrating MWP in the year 2000; since then, the MWP had been celebrated yearly. The celebration evolved from just merely ecumenical prayer service among the tri-religious leaders to the involvement of the different government agencies, especially the Armed Forces of the Philippines and the Philippine Nation Police that are tasked to preserve peace, order, and security.

The activities would start with ecumenical religious service followed with an open forum. The open forum includes present issues and social problems of the province. During the open forum, pertinent questions may be addressed directly to the proper agencies and authorities in the hope that a consensus might be achieved through an agreement or a formulation of a new policy. Students, on the other hand, are enjoined to take part in the activities, like the slogan and poster making contests. The celebration which started with just few stakeholders is presently a big celebration collaborated by the different tri-people and the local government of Butuan and Agusan.

Why celebrate Mindanao Week of Peace when there is no real peace in the island? According to Fr. Clase:

"Mindanawons are celebrating it together with our religious leaders not because we already have peace in Mindanao, precisely because we do not have it. Instead peace is our dream."

Now, MWP is being celebrated in all the parishes not only of Agusan provinces but also of the Caraga Region.

5 Conclusion

The organized protests that transpired in the Province of Agusan from 1950 – 2000 were articulations of the people to respond and prompt changes on the different social issues that affected them. The church on the other hand, reformed its programs into getting more involved to the lives of people. It introduced a family-based approach of evangelization that transformed the people holistically. Such programs resulted to the awakening of the people and made them aware of their conditions. Their awareness prompts them to take measures to trigger social change. The church influenced the people to take a united action to attain development independently. Contrary to some beliefs, the church did not encourage the people to go against the government but instead, its teachings awakened them to respond to the different situations that confronted them. Thus, it mobilized the people to bring an end to the social indifferences to the issues.

The church was influential in mobilizing the people. It continued to provide civic and political education to the community and venues for dialogue so that the marginalized people can have access to express their concerns. The programs of the church made people realize that people power can be a catalyst for change. Citizens should refrain from being indifferent to the society and continue to be vigilant to safeguard democracy as what their ancestors had done for them and be able to preserve democracy for posterity.

Conflict of Interests

The author declares that there is no conflict of interests regarding the publication of this paper.

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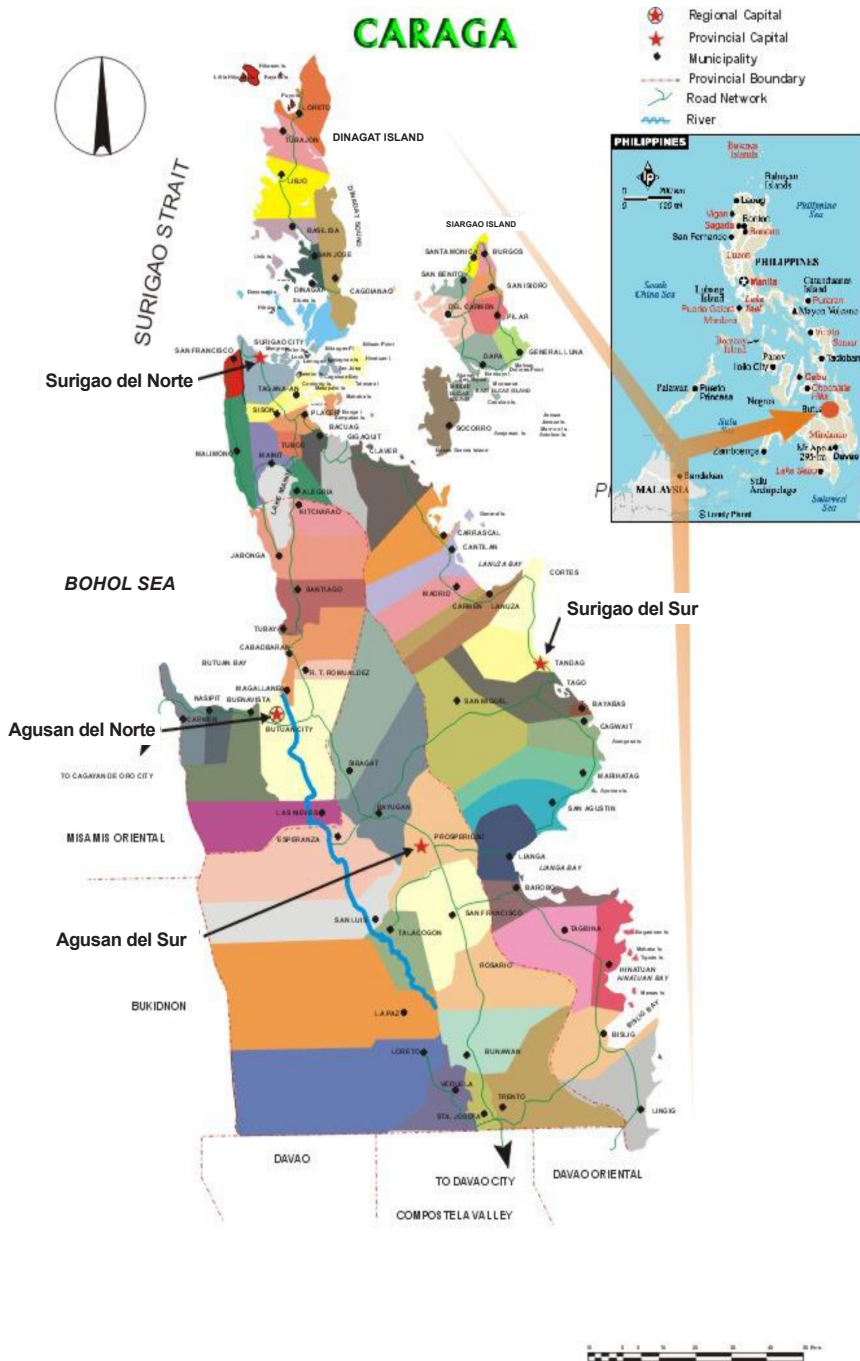


Fig. 1: Map of Agusan Provinces, Caraga Region.

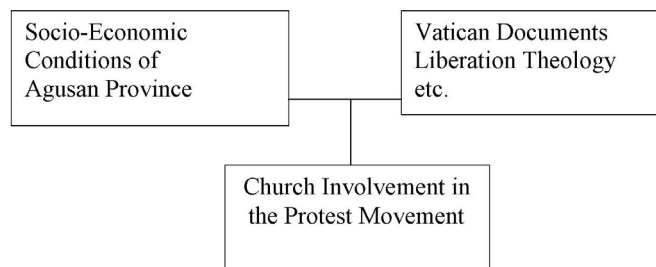


Fig. 2: Conceptual Framework

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