

Health Effects of Coal Plant among Nearby Residents

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ABSTRACT

Coal burning has been the most common and easiest source of electricity generation in the Philippines over the century. There is a need of proper medical and psychological attention as it integrates unusual health threats to humankind, especially the nearby residents. This study determined the health effects of coal plant among nearby residents in Batangas. Specifically, it determined the awareness of residents in the effects of coal plant. It identified the effects relative to health status; and finally, reviewed the existing policy and enhance/propose revision based on the results. This study used mixed method that combines the qualitative and quantitative approaches. The health hazards and poor air quality caused by the coal plant affects some of the residents around it. Proximity to the source of pollution and smouldering combustion typical of coal mine fires increase the risk of community exposure to high concentrations of known toxins such as aerosolised particles, and products of incomplete combustion. Long-term exposure with the said chemicals could lead to certain diseases. Most of the residents near coal plant are moderately aware that they suffer from different illnesses, but it does not mean that it is totally due to exposure to coal plant. Residents near coal plant can affect their health status physically and psychologically, whereas other residents do not claim that it is due to coal plant. There are parts of the policy which are not strictly implemented. Review and enhancement of the existing policies should be made because there are some laws that were not properly and effectively implemented based on the interview with the residents living near coal plant.

Keywords

Health Effects; Coal Plant; Nearby Residents

1. INTRODUCTION

Throughout the history of electricity generation in the Philippines, coal burning has been the most common and easiest source of light that produces a great impact on the human health. The fact that it integrates unusual health threats to humankind has been ignored and is still in need of proper medical and psychological attention. The health effects of coal plant among nearby residents was observed and studied through this study to understand and contemplate for the improvement of the health of the people living near these sources of biohazards [1].

The impact of this on human health is implausible and could convert the expected outcomes of the laws that regulate the environmental factors that integrate the right facilitation and the use of chemically toxic substances as source of power to the extent of degrading the health of citizens exposed to such pollutants. As observed during the visiting and analysis phase of the study, the coal power plants release smoke and residue, enough to affect and chronically destroy the environment and health over time, and the benefits of energy generation in

exchange for life's purpose. This affects the goals of environmentalists and those who are still against the coal smoke's embodiment of health intoxication.

Coal is known for its dark smoke produced when it is burned inside the coal power plant, which emits chemical compounds such as sulphur dioxide, nitrogen and particulate matter. The health effects from coal plants have been present ever since its first activity within an area near residents of a specific location, which promotes illnesses and currently unknown medical complications that are rarely diagnosed.

The most affected people are the elderly, pregnant women and children. There are leftover debris and smoke of the power plant that can be taken to non-specific areas brought about by factors related to weather conditions. These can affect others, which are not even exposed to the coal plant itself, rather experiencing the health effects just by the inhalation and pollution from their environment. The health effects will vary depending on the composition of a person such as age, genetics, medical conditions that are triggered by environmental stimuli. The main groups of diseases related to these environmental risk factors are cardiovascular, respiratory and nervous system diseases.

The use of coal is by burning it to extract energy but if not burned efficiently, there are substances that are harmful to human health such as ashes and coal smoke that causes pollution in the air. Many coal-fired power plants claim that they are now using new technologies to address these problems. However it still does not guarantee that it no longer emits harmful substances [2].

The utmost significance and importance of this study is to educate the residents of Brgy. San Rafael and Brgy. Dacanalo, Calaca, Batangas of the hazards of the coal plant near their location. This study give emphasis on the health status of the community residents, thus focusing on health promotion and disease prevention in times where they are exposed to hazards such as coal plants. Finally, this may aid the residents to become conscious of their environment, thus resulting to their increase in knowledge and create appropriate interventions and programs to maintain their health status.

Therefore, the aim of this study is to determine the health effects of coal plant among nearby residents in Batangas Province, and identify the effects relative to health status, as well as reviews the existing policy and enhance/propose revision based on the result.

1.1 Conceptual Framework

Figure 1 shows the effects in health of coal plant among nearby residents and how environment and health are correlated to one another.

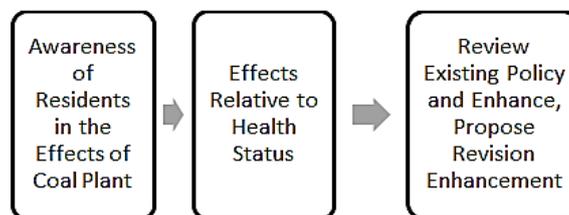


Figure 1.Health Effects of Coal Plant among Nearby Residents

2. METHODOLOGY

This study used mixed research method. Studies that are products of the pragmatist paradigm and that combine the qualitative and quantitative approaches within different phases of the research process [3]. Mixed-Method studies have emerged from the paradigm wars between qualitative and quantitative research approaches to become a widely-used mode of inquiry. Depending on choices made across four dimensions, mixed-methods can provide an

investigator with many design choices which involve a range of sequential and concurrent strategies.

2.1 Participants

The respondents of the study consisted of 215 residents of Brgy. San Rafael and Brgy. Dacanlao, Calaca. This was based on an effect size of 0.30 and a power probability of 0.95 using G* Power 3.1.9. The respondents were selected randomly and were proportionally allocated per barangay.

2.2 Instrument

The primary gathering instruments were health assessment tool and questionnaire. In the first part, the self-made questionnaire was used to gather data by knowing the respondents awareness of the effects of coal plant. The second part used the standardized questionnaire of Thornhill Naturopathic. The questionnaire is translated verbally in Filipino language. It was used to determine the health status of the people living near the coal plant site. This enables to draw out verbally conclusions in an actual scenario. Furthermore, the awareness of the respondents toward the scenarios can be determined.

2.3 Data Collecting Procedure

This study obtained the approval from the Dean of College of Nursing concerning the conduct of their study in selected places in Batangas. Besides that, this study also obtained the approval from the Municipal Government of Calaca, Batangas to conduct the study. The participants in San Rafael and Dacanlao, Calaca, Batangas were randomly selected.

2.4 Data Analysis

The data generated from the questionnaires were tallied, organized and tabulated in order to determine the health status and common diseases acquired by community people living in industrial zones. The statistical tools used were percentage, ranking and weighted mean distribution. Moreover, the following steps were used to analyse the qualitative results.

2.5 Qualitative Analysis

2.5.1 Transcribing of informants' Recorded Interviews

The surveyor transcribed all data and then compiled them for brainstorming.

2.5.2 Rechecking Transcribed Data

The transcribed data were validated for the completeness and correctness of information before data analyses process.

2.5.3 Reading and Analysing Data Gathered

Transcribed data were reread and then significant answers were highlighted and analysed.

2.5.4 Extracting significant statements from transcribed data

In preparation for data analysis, significant statements were extracted from the transcribed interview, compiled and were utilized to formulate categories based on the significance of the informants' statements.

2.6 Ethical considerations

Considering ethical aspect of research, sufficient time is given to the participants so they can depict their true view on research questions. Primary and secondary sources data were used in this study. A letter of consent was sent through an email to one of the heads of the institution to request for participation of both staff and clients in research. When permission has been granted, the research topic was introduced to the people who participated on voluntary basis. The surveyor requested for staff list from which respondents were selected as clients in the research. Consent from the participant was taken and appropriate permission was also ensured for usage of their given data. Confidentiality of the responses were be maintained

strictly to ensure privacy of their data. Semi-structured interviews were utilized extensively as interviewing format possibly with an individual or sometimes even with a group. These types of interviews were conducted once only, with an individual or with a group, and the respondents, identities were based on their permission, where if they were not willing to disclose identity, their identity would not be exhibited.

3. RESULT AND DISCUSSION

Table 1 shows the awareness of residents on the effects of coal plant with a composite mean of 2.69, with a verbal interpretation of moderately aware because it was mentioned by the residents that they had the knowledge and were aware about the coal smoke but did not provide attention to the effects. It was depicted that the residents were moderately aware on the health effects of coal plant. Most residents experience problems with their respiratory system, such as; difficulty in breathing and coughing, but do not consider coal as the primary reason, hence they also consider the harmful effects caused by the coal-powered plant.

Table 1. Awareness of Residents in the Effects of Coal Plant

Indicators	WM	VI	R
There is an alteration in breathing pattern due to polluted air caused by coal, i.e., difficulty in breathing.	2.80	MA	3
Colds occur among family members due to coal smoke emitted by coal power plants.	2.90	MA	1
Inhalation of petro-chemical is known to cause several types of respiratory diseases, such as pneumonia, asthma and bronchitis.	2.85	MA	2
Exposure to coal smoke over many years can increase the risk of diseases such as congestive heart failure and cardiac arrhythmias.	2.65	MA	10
Pollutants from coal plant can lead to cardiovascular diseases such as stroke.	2.55	MA	13.5
Coal pollutants also play a role in the development of Chronic Obstructive Pulmonary disease. cardio	2.61	MA	11
The family members can be affected by any kind of nervous breakdown from the excessive exposure to coal fumes produced by coal plant.	2.45	A	15
Infants and young children are affected by nervous system disorders due to coal smoke such as brain damage, mental retardation, blindness, seizures and inability to speak due to coal smoke.	2.60	MA	12
Inhalation of coal-infested air poses a great threat to human health which yields additional disorders of the nervous system, such as Alzheimer's disease.	2.55	MA	13.5
Coal combustion releases dozens of substances such as nitrogen oxide (NO _x), sulfur dioxide (SO ₂), mercury (HG) which are hazardous to human health.	2.73	MA	6
There is a contamination in streams and waterways from coal power plant pollutants that can lead to damage of local drinking water supplies.	2.76	MA	5
Air pollutants from coal plant can contribute to serious health effects including heart disease and lung cancer.	2.77	MA	4
air pollution from coal plant has a negative impact on cardiovascular and respiratory system	2.71	MA	8
Exposure to coal pollution leaves community people with illnesses such as stroke at pneumonia.	2.70	MA	9
The waste from coal plants can cause adverse effects to health and well-being, such as heat stroke, declining food production, scarce water supply, social conflict and starvation.	2.72	MA	7
Composite Mean	2.69	MA	

Legend: WM – Weighted Mean, VI – Verbal Interpretation, R – Rank.; For interpretation of scores 3.50 – 4.00 = Highly Aware(HA) ; 2.50 – 3.49 = Moderately Aware(MA); 1.50 – 2.49 = Aware(A) ; 1.00 – 1.49 Not Aware(NA)

Among the items cited, the presence of colds that occur among family members due to coal smoke emitted by coal power plants got the highest mean of 2.90, and a verbal interpretation of moderately aware. Cough and colds is the common problem encountered by the residents nearby coal plant. In that they are moderately aware that the reason behind the occurrence of cough and colds is due to the coal smoke emitted by the coal power plant. “Sometimes we experience cough and colds and fever, maybe it was caused of coal power plant” as

verbalized by the residents living near the coal plant. People with long-term exposure with these hazardous substances could develop reduction of lung function and chronic bronchitis and even premature death. People who are exposed short-term (hours or days) to the substances could have increase chances of aggravation of lung disease and could trigger asthma to attack and may also increase respiratory infections. These short-term exposures can be linked with heart attacks and minor irritations [4].

It is followed by the awareness of inhalation of petro-chemical, which is known to cause several types of respiratory diseases, such as, pneumonia, asthma, and bronchitis, with a weighted mean of 2.85, and a verbal interpretation of moderately aware. This shows that residents among nearby coal power plant are aware of several respiratory diseases such as pneumonia, asthma and bronchitis. But the residents have insufficient knowledge about the inhalation of petro-chemicals that could cause several respiratory diseases. One of the participant mentioned that *“In health, there were a times that the others have cough and asthma attack particularly the children. Maybe, because of emitted smoke and the direction of air that we inhaled or not.”* Coal ignition is a noteworthy danger to general wellbeing since it discharges particulate issue (PM), or a blend of to a great degree little particles and fluid beads noticeable all around. The span of the particles is specifically connected to their wellbeing impacts, with particles 10 micrometres (μm) or littler in width considered as more unsafe in light of the fact that these can go through the throat and nose and enter the lungs [5].

For the third rank, the awareness about alteration in breathing pattern due to polluted air caused by coal such as difficulty in breathing, which has the weighted mean of 2.80, and a verbal interpretation of moderately aware. Third in rank sums up that the alteration of breathing pattern is experienced by the residents near the coal power plant, and they have been moderately aware. Difficulty of breathing and cough is partially associated with air pollution caused by coal plant because in the beginning disease is there and difficulty of breathing was symptoms of this disease. *“My breath is fine all day even if I did my household chores. Perhaps there were people who have diseases and they have trouble in breathing because of coal power plant. But overall it doesn't happen to me at all.”* as stated by the residents. The ceaseless and irreversible mischief to human wellbeing is caused by means of immediate and backhanded pathways by the air poisons [6, 7]. Sulphur dioxide, particulate issue and nitrogen oxides (particularly nitrogen dioxide), which are radiated in substantial amounts by coal control plants. Sulphur and nitrogen oxides additionally respond in surrounding air, shaping optional fine particulates, while nitrogen oxides are likewise a forerunner for ozone. Both short and long-haul introduction to particulate issue and ozone are making huge harm human wellbeing.

And on the fourth rank, air pollutants from coal plant can contribute to serious health effects including heart disease and lung cancer which has a weighted mean of 2.77 and a verbal interpretation of moderately aware. Residents are aware that air pollutants from the coal plant could contribute to serious health effects. Upon interview, some residents stated that they experienced symptoms of having chest pain and even difficulty in breathing that could be related to heart disease and lung cancer. *“I have known some who have heart disease and who knows they acquire this illness because of coal power plant, nonetheless neither I and my family have heart disease.”* as mentioned by one resident. Coal-fired power plant that emits hazardous air pollutants can cause a wide range of health effects that include illnesses in heart and lungs. The exposure to these pollutants could lead to damages in brain, skin and even in breathing passages. And in long-term exposure can also affect learning, memory, as well as the behavioural status [8].

On the fifth rank; is that contamination in stream and waterways from coal power plant can lead to damage of local drinking water supplies, with a composite mean of 2.76, and has a verbal interpretation of moderately aware. As roam around the area, there are some streams that are polluted, and residents are aware that it could be from the coal plant but they stated that their waterways are not affected. Although water is not potable, it is clean and residents use the water to wash clothes and in taking a bath. *“In waterways, we don’t have problem with it because the water is clean, only the stream was muted. We live here more than a decade and we didn’t notice any illness due to the water.”* one participant mentioned.

There is a contamination in streams and waterways from coal power plant pollutants that can lead to damage of local drinking water supplies. As evidenced by The Environmental Protection Agency (EPA) [9], which found out that living alongside a coal transfer site can expand your danger of malignancy or different diseases. The residents have as much as a 1 out of 50 odds of getting malignancy from drinking arsenic-tainted water. Accidentally eaten, drank or breathed in, these toxicants can cause growth and sensory system effects, for example, intellectual shortages, formative deferrals and behavioural issues. This can likewise cause heart problems, lung infection, respiratory misery, kidney sickness, conceptive issues, gastrointestinal ailment, birth surrenders, and hindered bone development in kids.

The sixth rank shows that coal combustion releases dozens of substances such as nitrogen oxide (NO_x), sulphur dioxide (SO₂), mercury (HG) which are hazardous to human health with the verbal interpretation of moderately aware and has the composite mean of 2.73.

The residents living near the coal powered plant are moderately aware of the dozens substances that are released by coal combustion but it does not bother them because they do not have enough knowledge about the effects of substances emitted during coal combustion *“I know that there were a pollution coming from coal power plant, and I have a limited information about the harmful effects to our body. But I also don’t know the other chemicals emitted from coal plant because we didn’t care at all.”* as verbalized by the residents living near the coal plant. Coal plants are a noteworthy wellspring of lethal air contaminants, including mercury, nitrogen oxides, sulphur dioxide, and particulate matter. The review demonstrates that in Alberta every year this contamination adds to more than 4,000 asthma scenes, more than 700 crisis visits for respiratory and cardiovascular diseases, and around 80 healing center affirmations, with constant exposures bringing about almost 100 unexpected losses [10].

For the seventh rank, the awareness about the waste from coal plants can cause adverse effects to health and well-being, such as heat stroke, declining food production, scarce water supply, social conflict and starvation has the weighted mean of 2.72 and verbal interpretation of moderately aware. Residents in the community has the awareness that coal plant can cause adverse effects to health and well-being but it does not bother them and some residents does not consider coal plant as the main reason but only partially, because most residents were not that affected regarding their health and well-being. *“Maybe because of climate change and partially the pollution from coal power plant that is why someone experienced heat stroke.”* as mentioned by the resident. Communities are affected by a coal plant that exists within their vicinity and its effects are observed and are promoted on awareness throughout the span of time. Some of the people do not entirely notice the changes due to partial absence of negative results around the environment encircling their homes. Compared to others who are aware of the effects to their health and the environment, wherein an article mentioned that Calaca has turned into the filthy kitchen of enormous companies, where they keep their substantial modern operations, for example, coal plants [11].

For the eighth rank, air pollution from coal plant has a negative impact on cardiovascular and respiratory system; has the weighted mean of 2.71, and a verbal interpretation of moderately aware. The residents were aware that coal plant has a negative impact on cardiovascular and respiratory system due to its air pollution. Some residents stated that they had trouble in breathing when the coal plant emits smoke and sometimes the plant also releases foul smell. *“Yes, sometimes there is a thick smoke coming from coal power plant, and there is a foul smell. So we experience chest tightness and asthma attack mostly the children. Also the elderly they have chest tightness and difficulty of breathing when they inhaled the smokes from coal power plant.”* stated by the resident.

Ninth in the rank with the weighted mean of 2.70 shows that the residents are moderately aware that the exposure to coal pollution leaves community people with illnesses such as stroke, pneumonia, and rheumatic fever. The residents were moderately aware about the illnesses that can occur due to the exposure of coal pollution. Upon assessment with the residents with their exposure to coal pollution, most of the population suffers from illnesses such as stroke, pneumonia and rheumatic fever but doesn't consider coal as the reason but most residents consider other factors. *“Stroke and Rheumatic Fever occurs rarely, but Pneumonia is common among children and will still depend on the smoke emitted by the coal plant or at their own houses.”* as mentioned by the client. Air contamination created by coal burning in control plants can influence the respiratory and cardiovascular frameworks and additionally cause anomalous neurological advancement in kids, poor development of the fetus before birth, and can cause disease. Coal utilized for warming and cooking inside creates contaminations in indoor air that are known to cause respiratory infirmities and malignancy [4].

The tenth rank shows that exposure to coal smoke over many years can increase the risk of diseases such as congestive heart failure and cardiac arrhythmias, with a composite mean of 2.65 and a verbal interpretation of moderately aware. Residents living near coal plant are aware but not bothered that coal plant is associated with certain diseases such as congestive heart failure and cardiac arrhythmias. There are only few cases in the community; therefore residents are not bothered about the relative effect of coal plant in their health certainly in their cardiovascular system. *“There were only a few cases and news in the community of people of had heart problems because of the smoke from the coal plant, but I think there were, which is actually very rare. We have information about if smoke affects the heart.”* as mentioned by the client. Influencing the respiratory and cardiovascular structures, the tangible framework is similarly a target for coal defilement's prosperity impacts. Comparable instruments that are thought to mediate the effect of air poisons on coronary hallways in like manner apply to the courses that help the brain. This join instigation of the searing response and oxidative nervousness, which along these lines can incite stroke and other cerebral vascular disease; Coal pollutions furthermore follow up on the tactile framework to realize loss of academic breaking point, in a general sense through mercury. Coal contains take after measures of mercury that, when devoured, enter nature [12].

Eleventh in rank shows that coal pollutants play a role in the development of a disease has a weighted mean of 2.61 and a verbal interpretation of moderately aware. The residents are aware and experienced cases of developing a disease that has relation to coal pollutants from the coal plant. Some residents are aware of the development of chronic obstructive pulmonary disease from the coal pollutants emitted by the coal plant, but residents haven't experienced any symptoms of the said disease. *“Sometimes, we have difficulty in breathing, but as serious as COPD.”* as mentioned by the client. There are effects on health that coal power plants produced from prolonged exposure from its compounds through air pollution which makes it troublesome to elicit a stable, natural environment free from illness. Igniting

coal is a main source of brown haze, corrosive rain, and dangerous air contamination. Air poisons delivered by coal burning have been connected to serious harm to the human respiratory, cardiovascular and sensory systems [13].

The twelfth rank shows that the awareness on health effects about infants and young children are affected by nervous system disorders, with a composite mean of 2.60 and has verbal interpretation of moderately aware. This shows the effects of coal plant in infants and young children; residents are aware that the young children's nervous system can be affected by too much exposure to coal plant. Hence, residents have no history of any nervous disease among infants and young children. *"It's only natural for us to inhale the coal smoke, because we are already situated near the coal plant. Twice a week as an estimate. There are no problems regarding the drinking water and sources. If there were any kind of problems, the hospital is accessible."* as mentioned by the client. The three primary contaminations from coal-burning power stations are sulphur dioxide, nitrogen oxides and undetectable particulate issue (known as PM10 or PM2.5). All things considered, they go about as aggravations and cause irritation in the lungs prompting asthma, ceaseless lung malady, and limited lung development in kids. The little particles (PM2.5 and littler) are related with lung disease and are additionally ingested through the lungs into the circulation system to cause angina, heart assaults and strokes [14].

Tied on thirteenth point five rank shows that pollutants from coal plant can lead to cardiovascular diseases such as stroke and rheumatic fever and inhalation of coal-infested air poses a great threat to human health which yields additional disorders of the nervous system, such as cerebrovascular disease and Alzheimer's has the weighted mean of 2.55 and has the verbal interpretation of moderately aware. Residents living nearby coal power plant were moderately aware on certain cardiac disease and nervous disease such as stroke, rheumatic fever Alzheimer's. But the residents do not consider coal pollutants as a main reason of the certain disease in cardiac and nervous system, yet residents are more likely to consider genetics as the main factor of the occurrence of such disease in the cardiac and nervous system. *"There are no occurrences of such diseases because we are not affected by any. Even though we are near the coal plant, if there were any kind of illnesses happening, there are a few cases, but not all are."* as mentioned by the client. Lockwood, et al. [15] have pointed out that the evidence connecting air pollution and Alzheimer's comes from studies comparing brains of dogs and humans living in highly polluted versus non-polluted cities in Mexico. Animal data suggest that PM2.5 crosses the nasal mucosa and enters the limbic system of the brain via the olfactory nerve. Once in the brain, these PM cause inflammations and appear to lead to the deposition of amyloid, a neuropathological feature characteristic of Alzheimer's. The authors suggest that exposure to urban air pollution may cause brain inflammation and accelerate the accumulation of β -amyloid42, a putative mediator of neurodegeneration and Alzheimer's pathogenesis. Similar findings were reported in animal experiments in which several strains of transgenic mice were exposed to PM. The possible link between airborne pollutants and neurodegenerative diseases has not been firmly established. However, it is potentially important because of the large and growing number of patients with Alzheimer's and the disease's financial and societal impact.

Among the cited items, the family members can be affected by any kind of nervous breakdown from the excessive exposure to coal fumes produced by the coal power plant got the lowest mean of 2.45 and has the verbal interpretation of aware. The residents are aware about mental breakdown but do not consider the factor of the excessive exposure to coal fumes produced by the coal plant. And still consider genetic as the main factors affecting nervous breakdown. *"I happen to have nervous breakdowns, but not because of the coal plant."* as stated by the client. There are effects on health that coal power plants produced

from prolonged exposure to its compounds through air pollution, which makes it troublesome to elicit a stable, natural environment free from illness. Igniting coal is a main source of brown haze, corrosive rain, and dangerous air contamination. Air poisons delivered by coal burning have been connected to serious harm to the human respiratory, cardiovascular and sensory systems [13].

Table 1 shows the awareness of residents on the effects of coal plant, with verbal interpretation as moderately aware because it was mentioned by the residents that they had the knowledge and were aware about the coal smoke but did not provide attention to the effects. Residents are aware of the effects of the coal plant, such as air pollution, but they mentioned that it depends upon the direction of the wind and if they breathe the air or they are affected.

Bearing in mind that the realization of the effects of coal plant are fully understood by the general populace, especially those who are continuously exposed to its contaminants, Scholar, G. [16] cited that environmentally speaking, the average of 92 percent of respondents felt that they enjoyed cleaner air before the establishment of a coal plant near their villages and sounder sleep was reported by 89 percent of respondents. Estimated 74 percent responded that the environmental quality degraded post-coal plant.

3.1 Effects Relative to Health Status

Various categories of change in health status influence an individual's wellness. Decisions of a good and healthy lifestyle may promote their self-care. The cellular composition of a human being cannot be altered, that is governed by multiple classifications such as gender, age, environmental influences and genetics. Primarily, this study focuses on environmental influences that have a relation to health status of the residents living near coal plant.

The following effects were gathered during physical assessment and interview with the residents living near coal plant. This study then determined the effects that are categorized in physical and psychological status. In that most residents living near the coal plant experienced cough and colds; the common reason stated by the residents why they experience such illness is because of climate change. Residents also considered air pollution caused by the coal plant near their houses. Some residents complained that they also experienced difficulty in breathing, especially when the coal plant is emitting smoke from the fumes that according to residents carries foul smell and causes them to have trouble in breathing.

Since coal-powered plant releases substances that are hazardous to health that affect the breathing pattern of the residents living near coal plant, some residents are not knowledgeable about the hazardous effects of coal smoke from coal plant. However, few residents were able to maintain good breathing pattern.

Primarily, this study sum up that residents living near the coal plant do not consider coal plant as a factor that affects their health. Long-term exposure to the chemicals could lead to certain diseases. Coal-powered plant smoke is likely to have short-term adverse respiratory impacts. Adverse cardiovascular outcomes and increased mortality are also plausible depending upon the magnitude of exposure and the number of people affected. Since then some residents does not consider this as a factor of their health, instead they do not see the threats brought by the coal plant to their health. The health effects of coal plant are primarily in the resident's respiratory system due to the smoke and dust caused by the coal powered plant.

Most residents living near the coal plant experienced cough and colds. The common reason stated by the residents why they experience such illness is because of climate change, residents also consider the air pollution caused by the coal plant near their houses. "We

usually encounter colds, cough and sometimes fever also occurs, but not necessarily due to coal plant.” as verbalized by the residents living near the coal plant.

Some residents complained that they also experienced difficulty in breathing, especially when the coal plant is emitting smoke from the fumes that according to residents carries foul smell and causes them to have trouble in breathing. Burt, Orris, and Buchanan[4] specified that coal’s harmful effects include cardiovascular and respiratory diseases, and impairment of brain and nervous system development. Air pollution is cancer-causing to humans, and long-term exposure in particular can increase mortality rates, as evaluated by the World Health Organization. Coal projects can also impact mental health (which also affects physical health) and damage the social and economic well-being of communities.

Since coal-powered plant releases substances that are hazardous to health that affect the breathing pattern of the residents living near coal plant, some residents are not knowledgeable about the hazardous effects of coal smoke from coal plant. However, few residents were able to maintain good breathing pattern. *“Yes, there were times that there’s a thick smoke that is coming from the plant, and it emits foul smelling odour. That’s why we are experiencing tightness in our chest and for the children with asthma experiences attack. Mostly, in community especially the elderly are having difficulty of breathing when the plant is emitting the smoke.”* stated by the residents.

These mental health and social harms may include distress related to concerns about adverse health impacts, costs associated with environmental damage and declining land values, concerns regarding noise and air pollution, social divisions and inequalities between those benefiting from the coal industry and those who do not, and distress and disempowerment resulting from asymmetries of power, influence, and access to information and resources. *“We don’t see the coal plant as a problem especially when it’s not operating but when the plant is on its operation; there is noise and dust all day. That is why we are worried about the dust entering our houses and we couldn’t take our afternoon rest due to the loud noise.”* stated by the residents.

Residents living near coal plant do not experience any neurologic changes such as memory loss and confusion. With the physical assessment and history taking done with residents, there were no cases of Alzheimers in the community. *“Here in our place, we haven’t heard such cases of that disease, as well as that we are not aware that coal plant can cause the said disease.”* stated by the residents. This contraindicated with the study of Lockwood [15] called attention to that the confirmation associating in air contamination and Alzheimer's originates from looking at brains of canines and people living in very contaminated versus non-contaminated urban communities in Mexico. Creature information recommends that PM2.5 crosses the nasal mucosa and enters the limbic composition of the mind by means of the olfactory nerve. Once in the mind, these PM make aggravations and show up prompt the deposition of amyloid, a neuropathological highlight normal for Alzheimer's. Be that as it may, it is conceivably critical due to the substantial and developing number of patients with Alzheimer's and the infection's money related and societal effect.

In connection with that, Sears and Zeiroid [17] mentioned that ceaseless presentation to air contamination and particulate issue has been found to cause incessant irritation and hoisted levels of cytokines all through the body and cerebrum. A portion of the metals in fly remains are neurotoxins and presentation to neurotoxic substantial metals amid quick development in the beginning periods of life can disturb formative procedures and result in neurological breakdown.

Many of the residents have mentioned that the smoke emitted for coal power plants have been around for almost 30 years and they noticed the gradual changes to their health and environment upon comparison to the old time. Half of the informants said that they had trouble in breathing since the exposure to coal smoke and the other half contradicted that they feel no change in their breathing patterns and are indirectly affected by coal smoke. This source commonly affects children with cough and colds as mentioned by their parents. The locale of Calaca that is within the coal power plant, which includes Dacanlao and San Rafael, clouds of black smoke emitted at the top of the fumes from a distance scattered in all directions by a strong wind that permits access to coal smoke for every citizen in close range of the plant. *“We are not that affected by the coal plant, and we suffer from illnesses we do not take it to consideration that it is because of the coal plant but it is due to the climate change or stress and tiredness.”* stated by the residents.

Coal air pollution has an adverse impact to nervous system, specifically the brain. Cerebrovascular disease including stroke and loss of intellectual capacity due to mercury are the two most important neurological outcome of coal combustion. According to Domenice, et al. [18] in a study of relationship between fine particles (PM_{2.5} or less) and hospital admission rate for cerebrovascular disease, there are reported of 0.81% of increase in hospitalization.

3.2 Review of Existing Policies

Upon reviewing the existing policy about Republic Act 8749 or “Philippine Clean Air Act of 1999” that provides the policy framework for the country’s air quality management program and it also aims to uphold the privilege of every Filipino to breathe clean air. It focuses more on pollution prevention rather than control by encouraging cooperation and self – regulation among citizens and industries.

Section 3 (A) is all about declaration of policies wherein this state shall take along the order of environmental protection to the community residents. As stated by the American Lung Association [19], the process of coal burning affects the environs by its firing into the atmosphere, thereby distributing it outward into every direction that affects the air people breathe and have the inclination to affect potable urine sources and the stain used for farming.

Section 3 (C) Focuses primarily on pollution prevention rather than on control and provide for a comprehensive management program for air pollution. That is why the use of coal is by combustion it to obtain energy but if not burned efficiently, there are substances that are deleterious to human health such as ashes and coal smoke that causes pollution in the air [2].

Moreover, regarding Section 6 (A) which is air quality monitoring and information network states that annual national air quality status report is needed which shall be used in proposing about air quality improvement that will benefit the people living near coal plant. Green Peace Southeast Asia [5] modified particulate matter as a fine subatomic particle and is smaller than 1 /25th of the diameter of human hair. These are small enough to penetrate the lungs and bloodstream and cause a form of disease.

However, Section 6 (B) calls for the analysis and evaluation of current state, trends and projections of air pollution at the various levels provided. According to the article of hcwhglobal-admin [20] saying that coal-fired power plants directly and indirectly affects the health of the people through the route of climate change, that has its own circle of harmful health effects and Shearman D. [14] also put emphasis on Coal-fired post are health hazards to their local anaesthetic area and beyond due to pollutants they emit.

As can be seen in Section 6 (C) states the identification of critical areas, activities, projects which will need closer monitoring or regulation. That in fact Shearman, D [14] professed that

coal-fired station are menace to their local anaesthetic communities and beyond due to the pollutants they emit.

Through the survey, respondents claim that some laws were not properly and effectively implemented. The existing policies are reviewed, and the enhancement of that policy should add for the improvement and benefit the people living near coal plant. The enhanced version of the existing policies is tabulated in Table 2.

Table 2. Existing Policy and Enhancement of RA 8749 “Philippine Clean Air Act of 1999”

Existing Policy: PRA 8749 “Philippine Clean Air Act of 1999”	Enhancement
Section 3. Declaration of Policies. – (A) calls for the formulation of a holistic national program of air pollution management that should be implemented by the government through proper delegation and effective coordination of functions and activities.	To formulate program of risk reduction management that shall be implemented through proper implementation and coordination among the residents near coal plant. But up to now there is no serious program in place that can address the need for air pollution management. The rationale is that the people to benefit from RA 8749, the government should already undertake the first step, which is to introduce a functional and sound program that can guide the community in the proper practice of air pollution management. This way more positive results can be expected from the community.
Section 3 - (C) Focus primarily on pollution prevention rather than on control and provide for a comprehensive management program for air pollution.	To focus more on the effects of air pollution to the residents and to provide precautionary measures to avoid acquiring such diseases. The rationale behind this is clear; knowledge in the causes and effects and in the preventions of such will guide the people on what to do.
Section 6 - Air Quality Monitoring and Information Network – (A) extent of pollution in the country, per type of pollutant and per type of source, based on reports of the department’s monitoring stations.	To conduct air quality status to monitor each station regarding pollution in the country. This can be done through the support of non-government organizations This aims to have a status report periodically, which shall be used in order to make a program that will lessen air pollution.
Section 6 – (B) calls for the analysis and evaluation of current state, trends and projections of air pollution at the various levels provided.	To come up with an accurate analysis and evaluation based on the past with lesser pollution compared to the present state. If this section is enacted properly by the agencies concerned, there can be more effective way of addressing air pollution in the community. Having a group of the current level or state of the pollution, knowing the correct projections and understanding it in various levels most especially its effects can help the community get a better and clearer picture of the scenario at which they are in. This way they would know the simple steps they probably need to undertake to minimize the effects of air

	pollution, if not to totally eliminate them. The community should be guided on how to do things properly.
Section 6. – (C) identification of critical areas, activities, projects which will need closer monitoring or regulation.	Recognizing every area, activities, or projects which are in need for closer monitoring. This will provide every community to have an awareness regarding the projects and activities that the government will provide. Thus, enabling them to participate in ways that will help them expand their knowledge on the hazardous effects of living in any community that is exposed to coal.

4. CONCLUSION

Most of the residents near coal plant are moderately aware that they suffer from different illnesses but not necessarily due to exposure to coal plant. Living near coal plant can affect the residents' health status physically and psychologically whereas other residents do not claim that it is due to coal plant. There are parts of the policy, which have not been fully implemented.

In addition, this study also proposed the enhancement policy for the law that has been reviewed may be adopted and implemented. Residents should be made aware of the hazardous effects of coal, which could be done through community meetings and health seminars facilitated by the representatives of the owner of the company and the municipal or city health office and non – government organizations involved in the matter. Barangay health centers should encourage the residents near coal plant to seek information for them to know the factors that may contribute to the health problems.

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