

“Bantay Tambutso” Project Implementation for Reducing Air Pollution: The DMMMSU-NLUC, Philippines Experience

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Air pollution is one of the most serious environmental problems resulting from rapid industrialisation and increasing number of vehicles. To reduce air pollution in the school premises, the Don Mariano Marcos Memorial State University-North La Union Campus (DMMMSU-NLUC) adopted the “Bantay Tambutso” Project of the Department of Environment and Natural Resources (DENR). This promotes massive awareness to curb air pollution from vehicle emissions. This project is implemented through field testing with the technical personnel from the Land Transportation Office (LTO) and the extension workers. This project was carried out through the conduct of random stationary emission testing of the public, private and government vehicles in the school campus. This conduct aimed to check whether drivers and owners of motor vehicles are exercising proper and regular engine tune-up to prevent smoke belching and to check the compliance with the standards set forth under the Clean Air Act. Based on the random emission testing conducted, only 4 % and 7 % of the gasoline-fueled and diesel-fueled vehicles, failed the emission standards. Those who failed were suspended in using their vehicles until their vehicles compliance with the emission standards. This project was supplemented by other school programs to reduce or prevent air pollution in the school premises.

1. Introduction

One of the most challenging problems in today’s generation is environmental pollution and one of the most serious environmental problems is air pollution. Air pollution is defined as the presence of chemicals in the atmosphere in quantities and duration that are harmful to human health and the environment. It occurs when the concentration of certain substances become high enough to cause the atmospheric environment to become toxic (Gadi et al., 2012).

Air pollution can be resulted from both natural and human activities. Natural events that pollute the air include forest fires, volcanic eruptions, wind erosion, pollen dispersal, evaporation of organic compounds and natural radioactivity. Pollution from natural sources is not very often. On the other hand, human activities that result in air pollution include emissions from industries and manufacturing activities, and burning of fossil fuels. Waste incinerators, manufacturing industries and power plants emit high levels of carbon monoxide, organic compounds, and chemicals into the air. Petroleum refineries also release lots of hydrocarbons into the air. Similarly, cars and heavy duty trucks, trains, shipping vessels and airplanes all burn lots of fossil fuels to work. Emissions from automobile engines contain both primary and secondary pollutants. This make it difficult to manage air pollution because humans rely heavily on vehicles and engines for transporting people, goods and services (eSchooltoday, 2017).

Carbon monoxide is the main pollutant that is warming the Earth. Though living organisms emit carbon dioxide when breathing, carbon dioxide is widely considered to be a pollutant when associated with cars, planes, power plants, and other human activities that involve the burning of fossil fuels such as gasoline and natural gas (National Geographic Partners, 2017). In the Philippines, air pollution is among the main problems in highly populated cities and urban centers through fuel combustion in the industrial and transportation sector. In 2009 National State of the Brown Environment Report, it was reported that 65 % of air pollutants are from mobile sources such as cars, motorcycles, trucks and buses (Pedrosa, 2016).

Air pollution is the most crucial from the point of human health. Every human being inhales about 15 - 22 kg of air daily and if that air is polluted, human health is easily affected. Exposures to emissions of lead, mercury,

sulfur dioxide, particulate matter, carbon dioxide, and ozone-forming nitrogen dioxides are hazardous to public health. Toxic compounds such as mercury and lead, can lead to brain damage and eventually to death. Other pollutants like ozone and particulate matter, can cause respiratory diseases and other health problems particularly in children and the elderly (Cleaner and Greener, 2013).

The effects of air pollution are alarming. They are known to create several respiratory and heart conditions along with cancer, among other threats to the body. Children in areas exposed to air pollutants are said to commonly suffer from pneumonia and asthma (Kukreja, 2017). As cited by Pedrosa (2016), an estimated 800,000 people worldwide die prematurely from lung cancer, cardiovascular and respiratory diseases caused by outdoor air pollution. The children and elderly are the most vulnerable to the health impacts of air pollution. In the Philippines, high incidence of respiratory and other air pollution related diseases has resulted to the enactment of the most comprehensive legislation to address air pollution – the Philippine Clean Air Act or Republic Act 8749. The law aims to achieve and maintain clean air that meets the National Air Quality guideline values for criteria pollutants, throughout the Philippines, while minimising the possible associated impacts to the economy. On management of mobile sources, under the implementing rules and regulations of RA 8749, all private in-use motor vehicles and vehicles with updated or enhanced engines whose chassis are pre-registered with the Land Transportation Office (LTO) will only be allowed renewal of annual registration upon inspection by the LTO or other authorised private motor vehicle inspection center (EMB, 2009).

In the observance of the Climate Change Consciousness Week and the celebration of the Clean Air Month during the month of November, DMMMSU – North La Union Campus launched the Bantay Tambutso campaign, a program that promotes massive awareness campaign to curb air pollution from vehicle emissions. To complement the said campaign, LTO personnel are invited to conduct random emission testing of the public, private and government vehicles in the university campus. This conduct is aimed to check whether drivers and owners of motor vehicles are exercising proper and regular engine tune-up to prevent smoke belching and whether these vehicles are also complying with the standards set forth under RA 8749. Bantay Tambutso is among the various programs of the Environmental Management Bureau (EMB) adapted by several institutions focused on public awareness and education on air quality management under the Linis Hangin (Clean Air) Program of the department. The Bantay Tambutso in Schools is a program aimed at involving academic institutions promoting clean air and increasing and strengthening the advocacy for clean air, especially the attainment of emission standard for vehicles within school campuses.

2. Methods and Procedures

Bantay Tambutso is an extension activity of the Institute of Environmental Studies of the University under its Environmental Education Program. The program aims to increase awareness of community stakeholders to environmental projects and activities towards environmental protection. Extension projects and activities were first evaluated and approved by the Extension unit of the University before being implemented. This was launched last November 2012.

2.1 Study Area

The Bantay Tambutso project is conducted for 3 y in the strategic locations at DMMMSU-NLUC. The first year (2012) was conducted in the school premises at the entrance to the university campus; the second year (2013) was conducted in the road leading to the university campus near the national highway; the third year (2014) was conducted again in the school premises near the gate.

2.2 Implementers

The activity is a concerted effort of the following stakeholders:

- (a) The technical personnel of the Land Transportation Office (LTO) were invited for the technical assistance. LTO is the government agency mandated to apprehend owners of motor vehicles that failed to maintain the quality of its emission within the standards. They also provide the equipment for the random emission testing and trained students to perform the emission testing.
- (b) The security personnel of the University is also requested to assist in the random emission testing and in maintaining the flow of traffic.
- (c) Student leaders in the campus were requested to participate in the activity by assisting in the emission testing. They were also tasked together with the faculty extension workers to conduct information dissemination of the possible contribution of vehicular emissions to air pollution.

2.3 Emission Testing

The main activity in the Bantay Tambutso project is the conduct of random emission testing of the private, public and government vehicles that enters the school premises. The emission testing was initiated by the

technical personnel of LTO with the assistance of the security personnel, extension workers and students (see Figure 1).

The vehicles were randomly selected for emission testing. They were asked to stop and cooperate with the emission testing. A device was used to test the carbon monoxide content of the emission. The SPTC (brand name) Gas Analyser was used in the emission testing.

The Philippines' Department of Environment and Natural Resources (DENR) sets the emission limits for new passenger vehicles and light-duty vehicles. For gasoline-fueled vehicles, the carbon monoxide emission is set at 5.0 g/km and 1.5 g/km for diesel-fueled vehicles (ACFA, 2010). The DENR is coordinating with the LTO to step-up enforcement of emission testing prior to vehicle registration.

Aside from the random emission testing, the LTO personnel also checked the pertinent documents and registration of the vehicles and the license of the drivers.



Figure 1: Emission testings of (a) government vehicle, (b) public and private vehicles, and (c) motor vehicle by personnel of LTO, students and extension workers

3. Results

Analysis of the data gathered gave the result of the random emission testing of vehicles conducted for a period of three years. The result is relatively alarming, thus, the planning and implementation of various activities would help to mitigate and prevent air pollution in the school campus caused by various vehicles or mobile sources of air pollution.

3.1 Random Emission Testing

The three-year of implementation of the Bantay Tambutso project has increased the awareness of the vehicle owners on the maintenance of clean emission, vehicle condition and permitting and licensing required. Based on the result of the activity conducted, the number of vehicles randomly tested was greater in the first year (96 vehicles) of implementation followed by the second year (52 vehicles) and lesser in the third year (39 vehicles). It can be noted that lesser vehicles enter the school premises. This is because during the first year of implementation, it happens that the school was selected as the venue for province-wide Boy Scout jamboree wherein various vehicles enter the school premises for that event. During the second year of implementation, the location was not inside the school premises, instead it is conducted on the road leading to the school near the national highway. Other vehicles that enter into the communities along way to the location of the school were randomly selected. The third year of implementation was conducted inside the school premises.

Based on the result as shown in Figure 2a, during the first year (2012) of implementation, 2 % of the failed vehicles are gasoline-fueled while 9 % among the failed vehicles are diesel-fueled. The carbon monoxide emission is set at 1.5 g/km where there are greater number of vehicles failed to comply with the emission standards.

The more stringent emission standards than previous standards are distinguished by having been designed to accommodate alternative fuels, instead of hydrocarbons, the more stringent standards limit for organic emissions in the form of non-methane organic gas (Faiz et al., 1996).

Diesel engines and gasoline engines are quite similar. They are both internal combustion engines designed to convert the chemical energy in fuel into mechanical energy. Both diesel engines and gasoline engines convert fuel energy through a series of small explosions or combustions. The major difference between diesel and gasoline is the way these explosions happen (Brain, 2008).

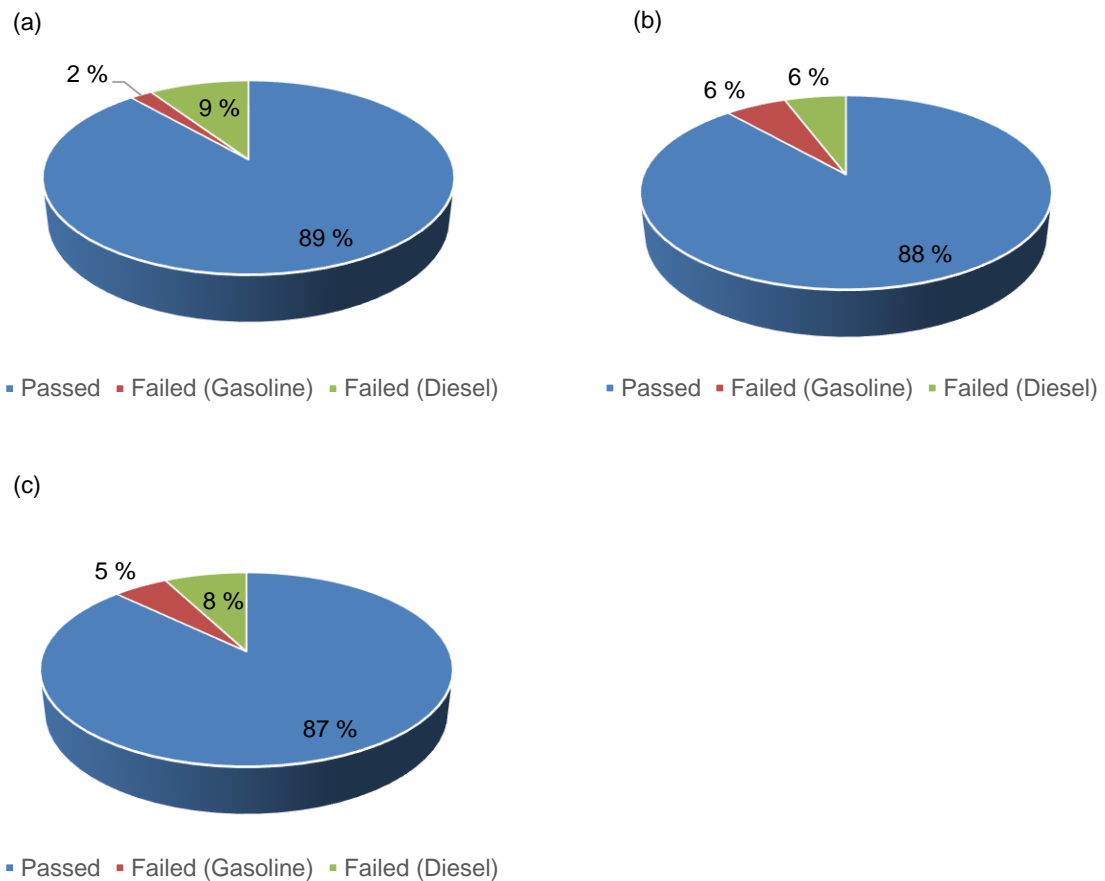


Figure 2: Result of random emission testing of vehicles in year (a) 2012, (b) 2013, and (c) 2014

During the second year (2013) of implementation as shown in Figure 2b, there are 6 % failed vehicles are gasoline-fueled and another 6 % failed vehicles are diesel-fueled. These vehicles emission do not compliance with the emission standards. It can be noted that there is a reduction for the number of failed diesel-fueled vehicles.

Diesel engines make so much torque. This is because of the stroke length, turbocharger boost, and average effective cylinder pressure. Turbo-diesels typically operate at higher turbocharger boost levels than do comparable gasoline engines (Baker, 2017). However, diesel engines are considered the largest contributors to environmental pollution caused by exhaust emissions. They are responsible for many health problems as well (Resitoglu et al., 2015).

During the third implementation in year 2014 as shown in Figure 2c, 5 % and 8 % of the gasoline-fueled and diesel-fueled vehicles, failed with the emission standards. The number of vehicles tested and the percentage of failed becomes lesser because of the heightened awareness of the community stakeholders on the prevention of air pollution through the maintenance of a good vehicular condition. According to EMB (2009), in

the Philippines the total number of apprehensions of smoke belching vehicles for the period 2005 – 2007 by the LTO decreased.

However, the number of vehicles that contributes to air pollution is still alarming, particularly on the diesel-fueled vehicles. Most of the diesel-fueled vehicles tested for its emission were jeepneys. In the Philippines, jeepneys continue its operation for longer years and even up to forty years. Longer years of operation of jeepneys contribute to the deterioration of its engine, thus, below the standards emissions. According to Harrington and McConnell (2003), emissions per kilometer traveled of vehicles tend to be high in developing countries, both because more vehicles were built to lower design standards and because emissions tend to increase with vehicle age. This is supported by Green (2018) that reported old and poorly maintained vehicles cause most pollution from cars, but clean, fuel-efficient cars have a reduced impact.

Diesel fuel contains more energy per liter than petrol and it is more efficient than petrol engines, diesel engines are more efficient to run. Diesel fuel contains no lead and emissions of the regulated pollutants (carbon monoxide, hydrocarbons and nitrogen oxides) are lower than from petrol cars without a catalyst.

In the Philippines, the enactment of Republic Act 9367, also known as the “Biofuels Act of 2006”, reduces the country’s dependence on imported fossil fuels. This would have positive effects on the protection of public health, environment and natural ecosystems and would provide opportunities for livelihood, especially in the production of biofuels (Congress of the Philippines, 2007). The critical issue regarding biofuels production is the emissions of greenhouse gases throughout the ethanol production life cycle (Chagas et al., 2016). Alternative technologies in the production of biofuels are necessary to reduce the emission of greenhouse gases.

3.2 Actions of the Administrator

The result of the Bantay Tambutso project conducted was given to the administrators for them to carry out further action. In the promotion of a cleaner atmosphere within the school premises, the apprehended drivers of vehicles who failed in the random emission testing activity were banned from entering the campus until such time that it meets the standard emission and the engines were fixed for better vehicle condition. Public vehicles who failed in the emission testing are not allowed to continue its operation until the standards were complied.

During the flag raising ceremonies during Mondays, the different community stakeholders were reminded of the policies concerning vehicle emissions.

Other activities were conducted in maintaining a clean and healthy environment for all the community stakeholders. One is the regular conduct of tree planting activities within the school premises. Trees are among the carbon sinks that absorb carbon dioxide and other pollutants. Trees absorb carbon dioxide and, through photosynthesis, convert it to biomass. Forest soils also store large amounts of carbon in their organic layer (David Suzuki Foundation, 2014).

Another activity is the maintenance of cleanliness and orderliness in the school premises. Regular clean-up activities were conducted and proper zoning in the campus were done, wherein there are designated areas for vehicles like public utility vehicles such as tricycles (Figure 3) and jeeps. Only vehicles with proper registration and drivers with valid license were allowed to enter the school campus.



Figure 3: Orderly and systematic tricycle transport services within the school campus

4. Conclusions

One of the contributors to air pollution is the emissions from exhaust of vehicles. This emission will deprive the rights of community stakeholders to breathe clean and healthy air and none can afford to breathe polluted air. To minimise and control air pollution, the DMMMSU-NLUC launched and conducted the Bantay Tambutso project adopted from the Department of Environment and Natural Resources. This was conducted for 3 years.

Only a small portion of the total number of vehicles tested for its emission, failed. However, diesel-fueled jeepneys, which are operating for decades, are among the vehicles that failed in the emission testing. Failed vehicles were not allowed to enter the school premises until emission standard was met. Other activities to help in the abatement of pollution and ensuring a clean and healthy school environment were conducted.

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