

Solutions on Global Energy and Environmental Crises: The Philippine Creative Approach

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INTRODUCTION

The earth contains limited amount of oil and it takes millions of years to form. With our world population size and growing demand from different nations, we use this source of energy at an alarming rate. The demand for oil becomes so high right then that it may run out of oil in the next 100 - 125 years when used persistently (Vadney, 2008).

Greenhouse Gases (GHG) emissions contribute largely to the energy crisis. Severe cases of GHG result to global warming and climate change that, in turn, would have great threats to the environment (Global Climate Change: Country and Regional Information, 2008). Unsolved problems of global warming and climate change might lead to, besides energy crisis, environmental calamity worldwide.

The Philippines has one of the highest cost and energy consumption rates in Asia because of inefficient generation and supply of electricity. The demand for energy grows exponentially and over half of its Greenhouse Gas (GHG) emissions are attributed to the energy sector (Global Climate Change: Country and Regional Information, 2008). Largely Carbon Dioxide (CO₂), GHG emissions in the energy sector are produced mainly from fuel combustion (Merilo, 2001) that releases huge amounts of environmental pollutants (Karki et al., 2005).

Plastic is another form of threat in which GHG emissions are reflected. Even if plastic bags can be reused, the problem starts once they have been made down to which they have been thrown up. According to Worldwatch Institute, producing 100 million plastic bags requires 430 000 gallons of oil (cited by Rueter, 2007). The world gets through about 500 Billion plastic bags yearly and just about 2% of them are recycled. Also, plastic bags break down into small, toxic particles that become part of the soil and water. For this matter, an estimated 1 million sea creatures have been killed yearly because of the plastic debris in the ocean coming from plastic bags (Drop the plastic bag.org, 2009). Moreover, burning of plastic waste produces hazardous environmental emissions. These sources of excessive pollution contribute to global warming and climate change.

The Philippines is highly disadvantaged to global warming and climate change hazards (ENFOR, 2002). The altering distribution of plants, shifting timing of plant growing, and changing of intensity and frequency of storms imply that there is no longer right climate for the plants and species (The Nature Conservancy, 2009).

Thus, sources of energy and the associated factors of environmental improvement management shall be integrated into developmental efforts to gain sustainable development for the economy (Karki et al., 2005). Managing its natural resources wisely in protecting the supply, quality and diversity is crucial as well (Global Climate Change: Country and Regional Information, 2008).

Ecological Solid Waste Management Act of 2000 (Republic Act 9003)

R.A. 9003 was signed into law on January 26, 2001. It is regarded as a broad-based and comprehensive approach to solid waste management. It involves segregation at source, segregated collection, storage, transfer, processing, treatment and disposal of solid waste (UNDP/DENR/NSWMC, 2008).

Several laws and policies were already implemented in the Philippines like the Commonwealth Act (C.A.) 383 or An act to punish the dumping into any river of refuse, waste matter or substances of any kind whatsoever that may bring about the rise or filling in of river beds or cause artificial alluvial formations, Presidential Decree (P.D.) 825 or Anti-littering law, P.D. 856 or Sanitation code of the Philippines, P.D. 984 or Pollution Control Law, P.D. 1152 or Philippine Environmental Code, R.A. 7160 or Local Government Code, P.D. 1160 or Vesting authority in Barangay Captains to enforce pollution and environmental control laws and for other purposes, R.A. 6957 or An act authorizing the financing, construction, operation and maintenance of infrastructure projects by the private sector, and for other purposes, among others (youtube-RA9003, 2007; Chan Robles Publishing Company, 2005). Even so, the government implemented R.A. 9003 to envelop all such policies and to add new innovations. Its unique features include having greater scope, being comprehensive, encouraging participation among private sectors, focusing on public education, and imparting heavy responsibility among Local Government Units (LGUs) (youtube-RA9003, 2007).

Government agencies on the national level are required to support LGUs in carrying out this responsibility. This is reflected by which the law requires LGUs to set a solid waste management plan (UNDP/DENR/NSWMC, 2008).

In terms of areas of responsibility, the *barangay* is tasked to ensure that households and establishments reduce waste, reuse materials, and recover recyclable items. The city or municipality runs a garbage collection system, proper waste treatment and disposal facility that protect the environment (UNDP/DENR/NSWMC, 2008).

The law invokes that waste is a resource that can be recovered. This, according to the law, can be realized by following the 3 Rs: reduction, reuse, and recycle. The law mandates individuals to put these principles into practice to solve the problem of solid waste management (UNDP/DENR/NSWMC, 2008).

This paper discusses two cases in the Philippines in which R.A. 9003 is reflected and complied, and where solutions in response to energy and environmental problems are projected.

The Case of Quezon City: Payatas Waste Disposal Facility

Opened in 1973, Payatas in Quezon City is a 22-hectare solid waste dumpsite where the garbage heaped up to 50 feet high and was generating 2, 200 tons of waste daily until year 2000 (Dazo, 2008; ADB waste disposal, 2004). Moreover, the methane gas that originated from this garbage mountain caused direct combustion and fire, thus, produced burns and inhalation hazards. The following year, R.A. 9003 was created and part of the law was to mandate the closure of all open dumpsites in the country by February 2006 (Dazo, 2008). Through R.A. 9003, the Quezon City government

promptly began to implement pioneering and innovative programs to ensure not only the continued safe operation of the site, but also its successful conversion into a controlled waste disposal facility (UNDP/DENR/NSWMC, 2008; Galing Pook, 2008).

In achieving and ensuring energy and environmental improvements and protection, Quezon City converted the Payatas Dumpsite into a Controlled Facility. Furthermore, it is the first in the country to capture methane gas from the dumpsite as an alternative energy source (Galing Pook, 2008).

The Payatas dumpsite rehabilitated with a multidisciplinary and sectoral effort. The city's basic concerns in Payatas are environmental health and safety, stability of the dumpsite, safety of the surrounding community, livelihood needs of those dependent on the site for income, and compliance with RA 9003 (Dazo, 2008).

In anticipation of the closure of the disposal facility, the government had constant dialogues and discussions with the scavengers and with the nearby communities. They talked about the state of the dumpsite and discussed the essential developments to ensure their health and safety, and the stability of the dumpsite. For alternative livelihood, scavengers were provided with financing and skills training as incentives to go into small business ventures and to prepare for other sources of income (Dazo, 2008).

The conversion of the dumpsite into a controlled waste disposal facility began in 2004. Several measures were included such as reshaping the slope of the garbage heap, stabilization and greening, drainage system improvement, fortifying roadways and access to the site, gas venting and recovery (refer to the chart).

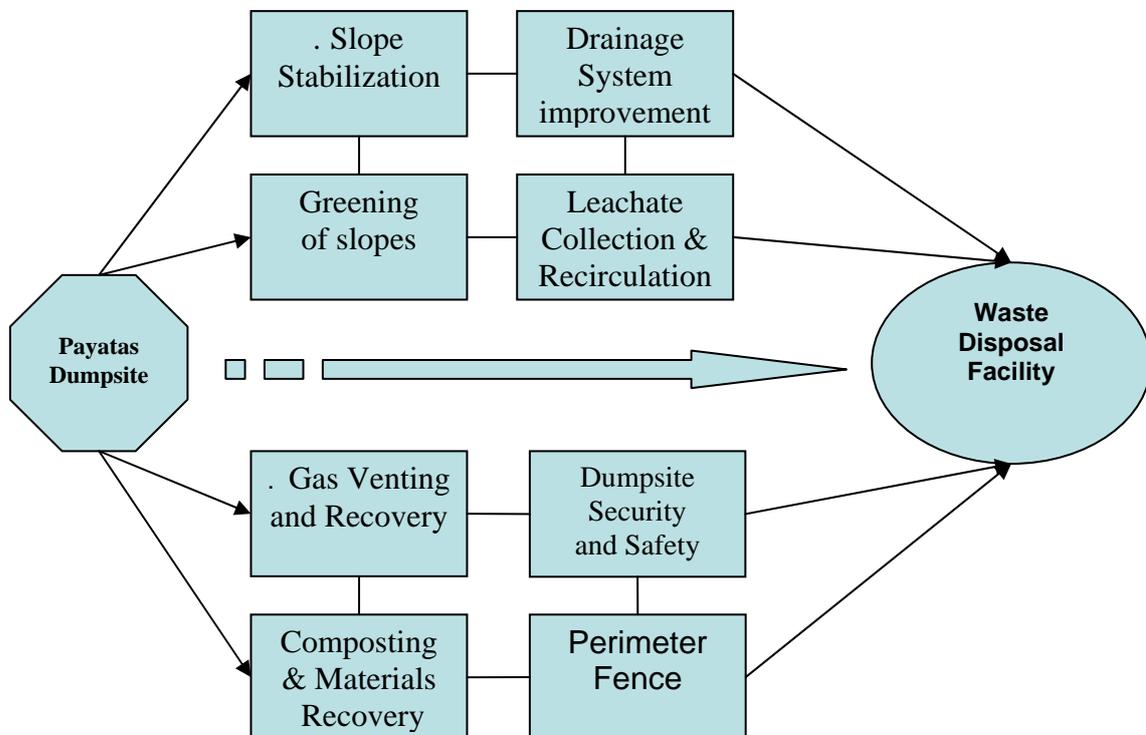


Figure 1. Conversion of Payatas Dumpsite into Waste Disposal Facility

Vetiver grass is used for greening the slopes. According to a phyto-remediation study of the Department of Environmental Engineering of the University of the Philippines, a Vetiver grass has a high soil holding capacity since its root system is very effective in absorbing heavy metals extracts from the waste leachate. Additionally, other ornamentals besides Vetiver grass were planted along the slopes and benches, principally in the Old Dumpsite, to stabilize the slopes against erosion. On the other hand, mongo beans were earlier planted all over to enrich the soil. Likewise, the plants not only served as erosion control, but also improved the aesthetic view of the dumpsite (Dazo, 2008).

The dumpsite's integrated drainage system was further enhanced by having the leachate collection system separated from the storm water drain. The open canals and ditches along the periphery of the dumpsite serve as catch basin for surface water runoff from the dumpsite and adjacent areas. These were widened and sustained through regular dredging to ensure efficient free flow of water whereas the piled sandbags were utilized to avert wash-up of the toe of the dumpsite. To catch the runoff from the upper benches, open canals were also made along the slope benches (Dazo, 2008).

To collect the leachate produced at the dumpsite, the city government preferred to install a separate system. The collected leachate, then, go to pumping stations where it is re-circulated onto the soil-capped mounds in order to water the vetiver grass and other plants. This not only enhanced the quality of the leachate through aeration but also improved decomposition of the compacted waste (Dazo, 2008).

The decomposition of garbage at the dumpsite produces a large amount of methane gas. This greenhouse gas is 21 times more powerful than carbon dioxide in inducing global warming. The methane gas, when not properly managed, might cause massive pollution or spontaneous combustion (explosion). Thus, gas vents, along with collecting and possibly treating the gas, were installed at the dumpsite to avert the potent effects of the gas and the dangers it poses to the dumpsite and surrounding communities (Dazo, 2008). These gas vents are steel pipes that are almost one meter wide in diameter. They have slots at certain intervals during which methane gas is absorbed and is then transmitted up toward the planned power facility (Aguiba, 2007).

In fact, the site has a Biodegradable Waste Processing Facility, equipped with a shredder sifter, in which organic wastes are processed to become composts. Additionally, it has a Materials Recovery Facility (MRF) used for recycling, storage and for primary, secondary and final sorting of wastes. These help to reduce the risks of environmental calamity (Dazo, 2008).

To ensure safety and security, the disposal facility comprises sufficient security personnel and its own trained firefighting unit available 24 hours daily (Dazo, 2008). Furthermore, the perimeter of the dumpsite was fenced for better control and security of the facility (Dazo, 2008).

In 2007, the Quezon City Controlled Disposal Facility Biogas Emission Reduction Project was approved and registered as a Clean Development Mechanism (CDM) under the Kyoto Protocol by the United Nations Framework Convention on Climate Change on February 1, 2008. This Project that converts biogas emissions into electricity will reduce GHG emissions by an annual average of 116,000 tons Carbon Dioxide equivalent (CO₂e). The benefits are improved local air, water and soil quality, elimination of fires and explosion hazards and avoidance of trashslides in the dumpsite (The Payatas Dumpsite: From Tragedy To Triumph, 2009; Dazo, 2008).

The disposal facility is expected to have a 200-kilowatt power capacity fueled by methane emitted from the decomposing waste from the site. The project saves fuel cost since methane is acquired for free (Aguiba, 2007), that is, electricity is practically granted away. For instance, streetlights in nearby roads are actually powered by the dumpsite; and, in the community area, the City government has launched “Plantsahan ng Bayan,” where households can simply plug their electric irons and do their laundry with electricity free-of-charge. (The Payatas Dumpsite: From Tragedy To Triumph, 2009).

The Payatas conversion program remarkably made the dumpsite to operate more efficiently, decreased operating costs while it made the facility safer and more environment-friendly. While it aims not only the safety of facility operators from garbage collapse, it also aspires for the reduction of the long-term effects of green-house gases in the atmosphere (Quezon City transforming payatas dumpsite, 2008).

The Case of Los Baños: Experiences in Solid Waste Management and No Plastic Policy

Unsystematic disposal of waste down to unsegregated solid wastes from different sources that started more than 20 years ago were some of the major areas concern of Los Baños. Mentioned in the presentation of Mayor Caesar Perez (2009), about 35 tons of mixed waste was generated daily and smoke from burning combustible wastes from the dumpsite was affecting the health of nearby communities. Moreover, non-biodegradable materials such as plastic bags and styrofoam clog the place’s canals, creeks, rivers, among others. Even though the municipality gave serious efforts to segregate compostable, recyclable and reusable waste materials, plastics and other similar materials stay in the waste mainstream and in time, become residuals (Wassmer, 2008).

These were the motivating circumstances that drove the municipality of Los Baños to implement more programs in response to these problems and to support environmental protection. Consistent with RA 9003, designing of solid waste management became one of the solutions of the Los Baños municipality. After some time, it passed an ordinance banning the use of plastic bags and Styrofoam (Perez, 2009).

The Los Baños government aimed to strategize in social, technical and political aspects. It socially prepared and empowered the Los Baños residents, employed local technology, and promoted political will to ensure proper reinforcement (Perez, 2009).

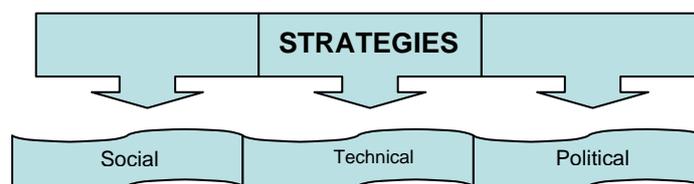


Figure 2. Strategies of Los Baños Solid Waste Management

Having the goal to instill discipline, participation and responsibility to the people in managing their waste, the Los Baños government set up meetings with different sectors and agencies to let them realize the real problem on solid waste. It organized the Linis

Ilog Team, and the Los Baños Recyclers and Traders Association. In terms of information, education and communication campaigns, it held motorcade, house-to-house campaign and distribution of flyers (Perez, 2009).

Aiming to eliminate remnants of open dumpsite, the municipality implemented waste segregation and recycling of non-biodegradable waste into usable form with the use of local and appropriate technology like shredder, plastic presser, and tin presser. Also, Crib-type and Static concrete pens were built for composting (Perez, 2009).

Also, as remedy of the energy problem, the municipality also utilizes biogas like Methane from biodegradable waste (Perez, 2009).

In line with the political strategy of the municipality, political will and leadership by example are essentially exercised by the government leaders for the community to accept and obey the implemented programs (Perez, 2009).



Forming of volunteer enforcers from different sectors

After implementing the proper reinforcement and using the described strategies, waste segregation is now being practiced in resorts, schools, households, among others. Furthermore, solid wastes are now collected systematically, and the dumpsite has turned into Eco-waste processing center (Perez, 2009).

In order to optimize the solutions in response to climate change and environmental threats, the municipality passed an ordinance banning the use of plastic bags on dry goods and Styrofoam. This is called the Municipal Ordinance 2008-752: An ordinance prohibiting the use of plastic bags on dry goods and regulating its utilization on wet goods and prohibiting the use of Styrofoam in the municipality of Los Baños and prescribing penalties thereof.

According to Los Baños Municipality Environment Staff Jercyl Laforteza (2009), the environment costs associated with the dominance of plastics and Styrofoam in the old dumpsite and the intergenerational responsibility are the major motivators of passing this ordinance.

In order to minimize the cost of resistance from different sectors and also to prepare the people, the municipality had series of meetings with them months before the ordinance was implemented. Other forms of communicating with the public about the ordinance are Public Address (PA), flyers, house-to-house campaigns, streamers, scholars of the municipality, and continuous meetings with different sectors (Perez, 2009; Laforteza, 2009).

Section 11 of the ordinance stated the prohibited acts of business establishments and/or individuals (see Table 1).

Table 1. Prohibited Acts Stated in the Section 11 of the Ordinance No. 2008-752

WET GOODS	Sell plastic bags to customers as SECONDARY packaging materials
	Provide plastic bags to customers as SECONDARY packaging materials
DRY GOODS	Sell plastic bags to customers as PRIMARY packaging materials
	Provide plastic bags to customers as PRIMARY packaging materials
FOOD AND OTHER PRODUCTS	Sell styrofoam as containers
	Provide styrofoam as containers
OTHERS	Dispose plastic waste

Upon the implementation of the ordinance, collectors are mandated to exclude plastic waste in the collection of non-biodegradable waste. The ordinance requires households to have the plastic waste materials cleaned and dried before they submit them to their respective *barangays* for proper disposal. Moreover, a special feature of the cleaned and dried plastic wastes is that they get shredded and then formed into various unique and useful products (Perez, 2009; Laforteza, 2009).



Corrugated roof, Hollow blocks, Tables and chairs, respectively

The trials and experiments on these products are on-going; hence, these products are limited yet to official use for further tests to ensure protection among the community (Laforteza, 2009).

The municipality also urges the people to utilize alternative packaging materials that are environmental-friendly like woven bags, cloth bags, paper bags and other similar materials, and to adhere to the Bring Your Own Bag program (BYOB) ((Perez, 2009; Laforteza, 2009; Bacon, 2009).



Alternative packaging materials

Besides addressing energy and environmental problems and mitigating climate change, the ordinance has also opened up opportunities for increasing people's welfare

and development. By the municipality's promotion on alternative environment-friendly packaging materials, producers of these materials find other sources of income. Furthermore, officials established Los Baños Recyclers and Traders, Inc. as part of the livelihood program in line with the ordinance (Perez, 2009; Laforteza, 2009).

The Municipal Environment and Natural Resources Officer (MENRO) was also established to monitor the effective implementation of this ordinance. By way of sustained meetings and monitoring, the municipality makes sure that this ordinance will be sustainable and effective (Laforteza, 2009).

After designing and implementing the solid waste management and the ordinance, sustained interactions with the organized sectors and massive communication campaign have continued. From a short span of time, the wastes generated have been reduced from 35 tons to 3-4 tons daily (Laforteza, 2009).

The Los Baños initiatives spearheaded its neighboring towns to follow suit and they were able to address a very concrete issue that is hurting the energy and most especially the environment (Bacon, 2009).

CONCLUSION

Problems that arise are most likely interrelated, that is, they came from same one or more causes that have to be mitigated as early as possible. When problems get unnoticed and untreated, they become severe and they evolve into crises. These crises bear new small problems that, in the long run, turn into web of problems. It is necessary, therefore, to search for solutions to respond to the problems. While it is essential that we identify the crises that the world is facing, it is necessary that we look closely on the causes of these problems in order to find the efficient solutions for these.

In the Philippines, the government identifies GHG emissions and plastic as major sources of energy and environmental crises. GHG emissions come from fuel combustion, power generation, among others, thus, account for atmospheric pollutants, climate change, and global warming. These, in turn, affect the environment; and plastic wastes worsen the case, posing danger to water resources as well. For this matter, the country adds efforts in finding alternative energy sources in a way that the environmental protection is enhanced at the same time. Reflective of the discussed solutions---R.A. 9003, The Payatas and the Los Baños cases---the government finds alternative sources of energy without hurting the environment.

To highlight some, given the mandates of R.A. 9003, Payatas has turned from a garbage heaped dumpsite into a controlled facility, capturing methane gas (GHG emission) while turning it into alternative energy source; The No Plastic Policy has encouraged individuals to use alternative materials, thereby reducing plastic wastes while encouraging alternative sources of income and promoting innovations on plastic conversion into useful products.

Solutions can start as simple and as creative as they are. What is more significant is we understand the situation and we recognize the problems to resolve.

Creative solutions capture the common preferences of people in a nation. These serve as driving force to invite people in unity of fighting off the problems. When people get united by common good, nations worldwide gather to defeat these global crises.

We have our own share of solutions. Nations shall join hand in hand in order to fight off crises. We need to think right then how our own nation can help in saving the earth.