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**Preserving Cultural Heritage through Good
Environmental Management
in Vigan City, Ilocos Sur:
A Contribution to the Philippines Country
Environmental Analysis**

Draft for discussion
Do not quote

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¹ World Bank Consultant. The findings, interpretations, and conclusions expressed herein are those of the author, and do not necessarily reflect the views of the World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent. This paper represents work in progress and comments to the author are invited (elmer_sm@yahoo.com).

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Summary

One of the critical challenges of urbanisation in developing countries is how to rein in the environmental impacts of progress with the need to maintain one's sense of social history, culture and heritage. Like the cities of Seville in Spain, Kyoto in Japan, Rome in Italy or even Manila in the Philippines, Vigan City wanted to remove the ravages of political warlordism that plagued its recent past and reclaim its once rich Spanish colonial cultural heritage and prestige it held in the 19th century.

When the city of Vigan decided to transform itself as a cultural heritage city, one of the core platforms of the city's cultural and heritage conservation programme and master plan was the environmental conservation and management of its existing resources. The city government viewed its cultural and heritage vision not only in the context of physical preservation and conservation of its colonial architecture and planning but as a cultural place where the cultural practices, industry, attitudes and natural environment by which the city's historical places are closely interlinked with each other.

One of the major environmental management programmes and challenges that the city embarked on is the city's air pollution problem brought about largely by the noise and smoke emissions of its more than 3,500 motorcycle taxis, mostly fitted with 2-stroke engines, that ply into the heritage city's narrow streets. The influx of vehicles, mostly public transport, was mainly precipitated by revival of Vigan's local economy following the success of its transformation into a cultural heritage site and tourist destination. The influx of tourists and visitors have resulted not only to a boom in tourism-related services, industries and facilities like hotels, restaurants, curio and souvenir shops and local artisan industries such as pottery, handicrafts, antique crafts, local textiles, among others but also a boon on local transportation and pollution emissions.

A comprehensive environmental analysis report prepared in July 2008 by the City's local environment office identified that problems of air pollution in the city are largely localised in certain areas of the city, particularly the major streets of the poblacion, which also covers the 'core area' of the city's heritage zone during 'rush hour'. These emissions according to the study were mainly traced to two stroke motorcycles that are operated as tricycles or public taxis and personal motorcycles (*CityENRO, 2008*). This problem, though transient, were believed to cause potential respiratory health problems particularly among the elderly, young and those suffering from asthma.

Other sources of air pollution in Vigan were attributed to periodic and localised open burning of leaves and backyard wastes in the city's nine *poblacion* barangays and agricultural wastes in the rural areas. Other potential sources of air emissions come from the firing of pottery ovens in the city's traditional pottery making barangay.

Poor air quality arising from emissions of 'dirty' 2-stroke engine tricycles² is an inherent challenge of many urbanising areas in the Philippines as well as in Asia. In the Philippines, 2-stroke tricycles provide the cheapest mode of public transport in almost all of the country's urban areas and major towns that it dominates all types of public transport. It is estimated that it makes up more than 30% of the country's public transport sector with around 1.3 million working class families depending on it as primary means of livelihood. Its proliferation is also triggered by local government's themselves. Licensing fees for the operation of tricycles are one of the sources of LGU revenues under RA 7160 or the 1990 Local Government Code. Over issuances of franchises for tricycle-for-hires by LGUs contribute to the concentration of motorcycles for hire in city and municipal streets thus exacerbating local air quality problems in the area.

To address the city's problem of air quality, the city passed City Ordinance No. 8, series 2006 that regulated the use of carbureted two-stroke engines by tricycle-for-hire in the city including those coming from other towns and required them to convert into 4-stroke engines or be retrofitted into a direct injection system. More than 85% or 3,000 out of the 3,500 tricycles operating in Vigan were 2-stroke carbureted engines.

Direct injection retrofit technology is a technological alteration of an existing carbureted two-stroke engine and replaced with an in-cylinder fuel injector. This results to significant reductions in tailpipe smoke

² Two-stroke engine tricycles are high emitters of carbon monoxide (CO), hydrocarbons (HC) and particulates. It is estimated that air emissions from a 2-stroke engine tricycle is equivalent to 50 automobiles.

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and harmful emissions as well as increased fuel economy compared to carbureted engine. Two-stroke engines produce a lot of pollution because the fuel-air mixture in them gets contaminated with the engine's lubricating oils. The direct injection retrofit technology replaces the engine's carburetor, which mixes the air and fuel before they enter the combustion chamber, with a direct in-cylinder fuel-injection system. This allows fuel to enter the combustion chamber when the exhaust port is closed. Eliminating nearly all the unburned fuel significantly reduces the ensuing smoke and hydrocarbons.

A major obstacle to the enforcement of the programme was overcoming the added economic cost on owners and operators of the tricycle-for-hires. To make the law compliant-friendly to affected tricycle operators and drivers, the city government instituted a parallel financing programme assisting tricycle operators and/or drivers fund their engine conversion. A local cooperative network, the Nueva Segovia Consortium of Cooperatives (NSCC), was tapped to serve as a financial assistance and collecting agent to the loan assistance package for converting 2-stroke engine tricycle operators and/or drivers.

The loan assistance package comes in the form of the distribution of the Envirofit³ to availing 2-stroke engine operators and owners who shall then remit to the conduit cooperative a daily loan payment of PhP 65 (or US\$1.45)⁴ 6 days a week for one year. The city government pays the interest of the loan making the financing scheme zero interest for the TFH operators/drivers. To date, the city government had invested three million pesos (PhP 3,000,000.00) to the NSCC for its micro lending program that includes loans for THF operators/driver converting their tricycles.

Based on the study commissioned by the city government, the conversion to direct-injection engine by 2-stroke engine motorcycles will result to an overall fuel cost savings of PhP 100-130/day (or US\$ 2.80) or an annual savings of PhP 23,520 (or US\$ 470.40). This will more than pay for the acquisition and installation cost of the conversion kit amounting to PhP 18,000/engine (or US\$ 400). Actual daily savings ranges from P80-150 on fuel and oil which is converted as additional income for THF.

Prior to the implementation of the motorcycle conversion programme in 2006, the city has earlier passed complimentary city ordinances and programmes on air quality management. These included mandatory emission testing in 1998 for all TFH as a requisite in granting a business permit-to-operate; stopped the issuance of new franchises in 2003 for TFH operating in the city; pedestrianization and re-routing of the vehicular traffic flow in and around the "core" and "buffer" zone areas of the Vigan City heritage zone that covers almost the major streets and roads in the *poblacion* area.⁵

The city government also promoted the use of non-motorised vehicles such as bicycles and horse-drawn carriages or "calesas" in the city especially within the heritage zone. Likewise, a noise pollution control ordinance banning the use of mufflers was also imposed in 2003 on all motorcycles traversing the city streets. Other efforts included are urban greening of major public areas such as the town's public market, transportation stops, public plaza and the streets along the main ancestral houses.

The strength of Vigan's air quality control programme as well as its other environmental management programmes was bolstered by the LGUs continuous allocation of annual budgetary support and resources for environmental services. Over the past five years, the city's environmental services has continually increased from almost five percent (4.12%) in 2003 to around 15% in 2007 of the total annual development funds (ADF) allocated from the city's internal revenue allotment (IRA). For fiscal year 2007, the city government approved the allocation of 43.43% of the city's IRA as its ADF which is more than the 20% minimum mandated under the LGC. Of the total PhP 47.47 million ADF allotted for 2007, almost 15% or around PhP7.0 million was for the environment development sector; 46.81% or PhP 22.22 million for the economic sector; and 38.44% or PhP 18.25 million for the social sector. For fiscal year 2008, the allotment for the

³ The Envirofit direct injection retrofit technology is the recommended engine replacement kit approved by the Vigan city government for converting 2-stroke engine owners and operators. The estimated cost of the kit is PhP 18,000 or US\$ 400.

⁴ US\$1 = PhP 45 at 30 August 2008

⁵ The Pedestrianisation ordinance banned the passage of any motorised vehicle along the heritage areas on Saturdays and Sundays while a permanent ban was imposed along the main ancestral houses row on Crisologo street.

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environment development sector increased by 30% amounting to PhP 10.2 million representing 18.82% of the ADF.

Finally, Vigan city's engine conversion programme is succeeding because of the strong community and political will shown by both local and community leaders. The consistent application and enforcement of the laws and apprehension of violators as well as continuous education and information campaign of the general public and local stakeholders facilitated better understanding and cooperation among all sectors. As part of the city's effort to fully involve in the city's environmental programmes and activities, it established a unique programme for the city's elderly to become active and useful members of the community by deputising the city's senior citizen's leaders as "environmental guardians". Likewise, all city government employees are also deputised as volunteer environmental guards. These have proven to be working based on the number of apprehensions and minimized incidents of littering and vandalism.

After merely 18 months after its full implementation, air quality problems in the city has resulted "significantly reduced" in the central area or *poblacion* since the enforcement of the motorcycle engine conversion programme (CityENRO, 2008). As of September 2008, a total 2375 TFH or 67.32% of all the TFHs were converted or have adopted an environment-friendly technology.

From 2004-2008, the city was awarded the cleanest and greenest city in the whole region as well as the most outstanding LGU-initiated environmental management programme in 2007. Its engine conversion ordinance has been reviewed by the neighboring province of Ilocos Norte for possible replication as well as in other cities in the country. The city's effort to reduce air emissions through the engine conversion programme and other environmental laws are seen to contribute immensely to the city's heritage conservation programme and its growing image as a primary tourist destination site in the Northern Philippines.

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A. Overview

1.0 Physical characteristics

Vigan is the capital of the province Ilocos Sur. It is situated along the western coast of Northern Luzon facing the South China Sea. It is bounded the north by the Municipality of Bantay, on the east by the Municipality of Santa and on the South by the Municipality of Caoayan, on the West by the Municipality of Sta. Catalina and on the Southwest by China Sea. It is 408 kilometers to City of Manila; 80 kilometers from Laoag City 139 kilometers from San Fernando, La Union.

It has a total land area of 2,511 hectares 25.11 square kilometers. The poblacion barangays which consist of nine barangays have a land area of 144.75 has. The adjoining 30 barangays make up 23,662.5 has. Vigan has 39 barangays including the nine barangays created under PD No. 86. It is a 5th class city⁶ with an estimated population of around 47,246 based on 2007 Census. (www.wikipedia.com, 10 August 2008)

(Source: www.wikipedia.com, 10 August 2008)

Vigan is a unique environment in both its natural and man-made features. It is traversed by two river systems namely; Govantes River and Mestizo River. Its tributaries flow into the Pangada River in Sta. Catalina, Caoayan River in Caoayan, Boquing River in Bantay and the Bantaoay River in San Vicente. Unlike other municipalities with towering mountains, Vigan is mostly plains with gently rising hills on the southern portion. Most of its lands are devoted to agriculture which are located outside of the urban center or poblacion.

Mode of transport within the city is purely land base. Vehicles for public use include jeepneys, tricycles and calesas. Buses, Mini-buses and jeepneys provide transportation to places outside Metro Vigan. The Metro Vigan transport system is serviced by tricycles, which were color-coded for purposes of identifying the municipality to which they belong. The tricycle number is permanently attached on top of the side car specified by different colors: blue plate for Vigan and yellow plates for Bantay, Caoayan, San Vicente and Sta. Catalina. A horse drawn vehicle, locally called "*calesa*" is also servicing the locality. It is an ideal transportation for sightseers particularly tourist. (www.philsite.com, 10 August 2008)

2.0 Reclaiming Vigan's cultural and historical legacy

When the city of Vigan⁷ was formally inscribed in the UNESCO World Heritage List of Site and Monuments on 02 December 1999⁸, it was the culmination of a painstaking and determined effort by the citizens of the city and its city government to revive and reclaim its pre-colonial and colonial heritage and

⁶ Under Republic Act 7160 or the new Local Government Code, cities are classified according to average annual income based on the previous 3 calendar years: 1st class - P300 million or more, 2nd class - P240 million or more but less than P 300 million, 3rd class - P180 million or more but less than P240 million, 4th class - P120 million or more but less than P180 million, 5th class - P60 million or more but less than P120 million, and 6th class - Below P 60 million.

⁷ The name "vigan" is believed to have come from the word *bigaa* (*Alcacia Macroniz.*), a giant Taro plant belonging to the Gabi family which used to thrive at the bank of the Mestizo River.

⁸ Vigan was nominated three times for the UNESCO World Heritage List and was finally included in the said list on December 2, 1999.



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legacy as one of the country's center of trade, culture and political power. Vigan is one of only five UNESCO heritage sites found in the Philippines and the only city in the Philippines included in the Organization of World Heritage Cities in the world.

Vigan is unique among the Philippine towns because it is the country's most extensive and only surviving historic city that dates back to the 15th century Spanish colonial period. The World Heritage Centre officially cites "Vigan represents a unique fusion of Asian building design and construction with European colonial architecture and planning." (www.vigancity.gov.ph/history, 10 August 2008).

Vigan was an important coastal trading post in pre-colonial times. Long before the Spanish galleons, Chinese junks sailing from the South China Sea came to Isla de Bigan through the Mestizo River that surrounded the island. On board were sea-faring merchants that came to barter exotic goods from Asian kingdoms in exchange for gold, beeswax and other mountain products brought down by natives from the Cordilleras. Immigrants, mostly Chinese, settled in Vigan, intermarried with the natives and started the multi-cultural bloodline of the Bigueños (www.vigancity.gov.ph/history, 10 August 2008).



In May 1572, Captain Juan de Salcedo was ordered by the then Spanish governor general Guido de Lavezares to set sail for the Ilocos region on the coast of the shores of the river Bigan. Arriving on 12 June 1572, Salcedo claimed the land on the shores of the river Bigan in honor of the Spanish King Philip II's son, Prince Ferdinand and named it "Villa Fernandina de Vigan". It became the 3rd city founded by the Spaniards after Manila and Cebu.

Because of its strategic role in the Manila-Acapulco galleon trade, Vigan city became a very prosperous and thriving city that became the melting pot of the Spanish elite, Filipino ilustrado and Chinese merchant migrant classes in the North.

(Source: www.philsite.com, 10 August 2008)

With its ancestral houses, cobble-stoned streets, horse-drawn carriages called *calesas*, artisans shops for clay pots or *burnays*, hand-loomed blankets called *abels* and its beautiful classical plaza, Vigan enjoyed the trappings of an Old World European city until the end of the galleon trade in the 19th century. Indeed, Vigan The end of the galleon trade also marked the decline of Vigan's lustre that continued to the American period and after World War II.

By the time the Philippines finally got its independence from the Americans in 1946, Vigan has been transformed into a Virginia tobacco-producing region by American businessmen. Its ancestral houses and old world charm was taken over by traders and became disused as warehouses and stockrooms. By the 60's and 70s Vigan plunged into anarchy and violence from warring political clans that drove away businesses and abandonment of its ancestral houses and cultural heritage. Once the centre of Spanish culture, commerce and Old World charm in the Philippines, Vigan, by the 1980's and 1990's, now downgraded as a 2nd class municipality, slowly rotted away its cherished colonial history and cultural legacy.

It was only until the mid-1990s upon the assumption of a new generation of city officials led by Mayor Eva Marie S. Medina imbued with a strong sense of mission and desire to return Vigan to its old colonial glory decided to take on the task of transforming the old decaying Vigan into a vibrant cultural and historical heritage city. After a decade of dedicated and committed work to achieve its common vision to make Vigan "a bustling center for tourism, commerce and treasures our rich cultural and historical heritage", the city and cultural glory. The World Heritage citation for the city exceptionally intact and well preserved example of a Euro

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3.0 Linking environmental management to sustain Vigan's



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The city government views its cultural and heritage vision not only in the context of physical preservation and conservation of its colonial architecture and planning but as a cultural place where the cultural practices, industry, attitudes and natural environment by which the city's historical places are closely interlinked with each other.

(Source: www.philsite.com, 10 August 2008)

As Vigan city mayor Eva Marie Medina succinctly puts it "heritage is our environment vigilantly preserved by our forefathers for us to enjoy and make use of today". Thus the entire city's environmental management programmes and actions initiated here are directly linked on how the city's cultural and heritage vision can be achieved and pursued.

B. Preserving the city by preserving the city's air quality

1.0 A problem borne out of a city's success

One of the major environmental management programmes and challenges that the city embarked on is the city's air pollution problem brought about largely by the noise and smoke emission's of its more than 3,500 motorcycle taxis, mostly fitted with 2-stroke engines, that ply into the heritage city's narrow streets.

The influx of vehicles, mostly public transport, into Vigan can be traced to Vigan's economic revival following the success of its transformation into a cultural and heritage site and tourist destination. The influx of tourists and visitors have resulted to a boom in tourism-related services, industries and facilities like hotels, restaurants, curio and souvenir shops and local artisan industries such as pottery, handicrafts, antique crafts, local textiles, among others.

Prior to the conversion of Vigan into a heritage city in the late 1990's, according to the report of the 2001 Vigan Master Plan or the Master Development Plan for the Revitalization of the Historic Center of Vigan, the over-all air quality of the city was reportedly still acceptable. Air quality data collected by the Department of Environment and Natural Resources (DENR), the national agency mandated to monitor air quality, showed that Vigan's air quality met the Philippine Air Quality Criteria (*CityENRO, 2008*). However, given the increasing urbanisation of the city air pollution levels were projected to "inevitably rise" (*CityENRO, 2008*).

A comprehensive environmental analysis report prepared in July 2008 by the City's Environment and Natural Resources Office (CityENRO) assisted by the Canadian Executive Service Organisation (CESO), identified that problems of air pollution in the city are largely localised in certain areas of the city, particularly the major streets of the poblacion, which also covers the 'core area' of the city's heritage zone during 'rush hour'. These emissions according to the study were mainly traced to two stroke motorcycles that are operated as tricycles or public taxis and personal motorcycles (*CityENRO, 2008*). This problem, though transient, were believed to cause potential respiratory health problems particularly among the elderly, young and those suffering from asthma.

Other sources of air pollution in Vigan are attributed to periodic and localised open burning of leaves and backyard wastes in the city's nine *poblacion* barangays and agricultural wastes in the rural areas. Other potential sources of air emissions come from the firing of pottery ovens in the city's traditional pottery making barangay.

Poor air quality arising from emissions of 'dirty' 2-stroke engine tricycles⁹ is an inherent challenge of many urbanising areas in the Philippines as well as in Asia. In the Philippines, 2-stroke tricycles provide the cheapest mode of public transport in almost all of the country's urban areas and major towns that it dominates

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all types of public transport. From the three-wheeled motorcycles with sidecars found in most urban areas in Luzon and Metro Manila to the single seater-for-hire motorcycles called *habal-habal* or *Skylab* in the Visayas and Mindanao, motorcycle transport has been the dominant means of public and personal transport in the country.

It is estimated that it makes up more than 30% of the country's public transport sector with around 1.3 million working class families depending on it as primary means of livelihood. Its proliferation is also triggered by local government's themselves. Licensing fees for the operation of tricycles are one of the sources of LGU revenues under RA 7160 or the 1990 Local Government Code. Over issuances of franchises for tricycle-for-hires by LGUs contribute to the concentration of motorcycles for hire in city and municipal streets thus exacerbating local air quality problems in the area.

2.0 Engine retrofitting and conversion of 2-stroke engine motorcycles and tricycles

To address the city's problem of air quality, the city passed City Ordinance No. 8, series 2006 that regulated the use of carbureted two-stroke engines by tricycle-for-hire in the city including those coming from other towns (Bantay, Caoayan, San Vicente, & Sta. Catalina) by requiring them to convert into 4-stroke engines or be retrofitted into a direct injection system.



It justified that the ordinance was an air quality control action of the city government not only in compliance with the mandates of RA 8749 otherwise known as the Philippine Clean Air Act but more so because of the city's commitment in protecting the environment from activities that cause ecological imbalances. More than 85% or 3,000 out of the 3,500 tricycles operating in Vigan were 2-stroke carbureted engines.

Under this ordinance, all tricycles-for-hire (TFH) in the city shall be retrofitted with a direct injection technology, developed by a Filipino partner of a US-based non-profit foundation¹⁰, or decommissioned and replaced by motorcycles using four-stroke engines.

Direct injection retrofit technology is a technological alteration of an existing carbureted two-stroke engine and replaced with an in-cylinder fuel injector. This results to significant reductions in tailpipe smoke and harmful emissions as well as increased fuel economy compared to carbureted engine.

Two-stroke engines produce a lot of pollution because the fuel-air mixture in them gets contaminated with the engine's lubricating oils. Simultaneously the combustion chamber draws in the contaminated mixture as exhaust gases are expelled through an exhaust port. Some of the fuel and oil gets mixed with the exhaust.

The direct injection retrofit technology replaces the engine's carburetor, which mixes the air and fuel before they enter the combustion chamber, with a direct in-cylinder fuel-injection system. This allows fuel to enter the combustion chamber when the exhaust port is closed. Eliminating nearly all the unburned fuel significantly reduces the ensuing smoke and hydrocarbons. The conversion kit includes an air compressor, wiring harness, custom brackets, and a new cylinder head.

Based on a 100,000km field testing validation study done by Envirofit in June 2006 on the direct injection solution showed dramatic reductions in various air and toxic fume emissions of engines retrofitted with the direct injection system, namely:

- reduction in hydrocarbons (HCs) by 89%

¹⁰ The Vigan city government commissioned Envirofit Philippines, Inc., a Philippine partner of Envirofit International, a University of Colorado, USA-based non-profit foundation, to conduct a year-long comparative evaluation and testing of various engine configurations for tricycles that would reduce air and smoke emissions for 2-stroke engine motorcycles.

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- reduction of carbon monoxide (CO) by 76%
- reduction in 2T¹¹ oil consumption by 50%
- reduction in fuel (regular) consumption by 35%

According to these test results, direct injection 2-stroke engines were reportedly cleaner and got better fuel economy than carbureted 4-stroke engine replacements (Envirofit, n.d)

The engine conversion ordinance also provides for a phase-out programme for compliance of the TFH owners based on the motorcycle engines manufacturing date or year model.¹² The ordinance also allows owners to use other types of technology is acceptable to the standards set by national agencies concerned with the environment. The timetable for the phase-out programme was listed as follows¹³:



that

- Motorcycle units with year models 1972-1980 compliance period was until 30 November 2007;
- Year models 1981-1984 until 31 December 2007;
- Year models 1985-1990 until January 2008;
- Year models 1991-1993 until March 2008;
- Year models 1994-1995 until May 2008;
- Year models 1996 until June 2008; 1997-1998 until September 2008; 1999-2000 until November 2008; 2001 until December 2008; 2002-2003 until February 2009; and, 2004 until March 2009.

However, to make the law compliance friendly to affected tricycle operators and drivers, the city government instituted a parallel financing programme to assisting tricycle operators and/or drivers fund their engine conversion. A local cooperative network, the Nueva Segovia Consortium of Cooperatives (NSCC), was tapped to serve as a financial assistance and collecting agent to the loan assistance package that will be given to converting 2-stroke engine tricycle operators and/or drivers.

The loan assistance package comes in the form of the distribution of the Envirofit¹⁴ to availing 2-stroke engine operators and owners who shall then remit year to the conduit cooperative a daily loan payment of PhP 65 (or US\$1.45)¹⁵ 6 days a week for one year. The LGU covers the payment for the loan interest of the assistance. The city government pays the interest of the loan making the financing scheme zero interest for the TFH operators/drivers. To date, the city government had invested three million pesos (PhP 3,000,000.00) to the NSCC for its micro lending program benefitting the women and less fortunate Bigueños and THF operators/driver converting their tricycles.

Based on the study done by Envirofit as commissioned by the city government, the conversion to direct-injection engine by 2-stroke engine motorcycles will result to an overall fuel cost savings of PhP 100-

¹¹ 2T is an affordable type of fuel additive normally mixed by local tricycle drivers with regular gasoline fuel to increase combustion in 2-stroke engine motorcycles.

¹² 2-stroke engine motorcycles in the Philippines were manufactured and distributed until 2000.

¹³ The detailed compliance period for the phase-out programme was contained in a subsequent ordinance passed by the city council on 17 October 2007, a year after the passage of the conversion ordinance.

¹⁴ The Envirofit direct injection retrofit technology is the recommended engine replacement kit approved by the Vigan city government for converting 2-stroke engine owners and operators. The estimated cost of the kit is PhP 18,000 or US\$ 400.

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130/day (or US\$ 2.80) or an annual savings of PhP 23,520 (or US\$ 470.40). This will more than pay for the acquisition and installation cost of the Envirofit amounting to PhP 18,000/engine (or US\$ 400). Actual daily savings ranges from P80-150 on fuel and oil which is converted as additional income for THF.

3.0 Complimentary city ordinances and initiatives to improve air quality.

While the 2-stroke engine conversion programme was implemented in 2006, complementary ordinances affecting air quality control in Vigan has earlier been passed and implemented by the city government. As early as 1998, prior to the passage of the Philippine Clean Air Act of 1999, the city government requires that all TFH to undergo mandatory emission testing as a requisite in granting a business permit-to-operate a THF. In 1999, the city government has stopped the issuance of new franchises for TFH operating in the city. This measure was further complimented by the pedestrianization and re-routing of the vehicular traffic flow in and around the “core” and “buffer” zone areas of the Vigan City heritage zone that covers almost the major streets and roads in the *poblacion* area.¹⁶ The city government also promoted the use of non-motorised vehicles such as bicycles and horse-drawn carriages or “calesas” in the city especially within the heritage zone. Likewise, a noise pollution control ordinance banning the use of mufflers was also imposed in 2003 on all motorcycles traversing the city streets.

Other efforts included are urban greening of major public areas such as the town’s public market, transportation stops, public plaza and the streets along the main ancestral houses. In 2007, it also established a 10-hectare Vigan Watershed Tree Park, to complement the existing tree parks in the schools and barangays in absorbing air pollutants. The LGU also reorganised street vending within the city’s core center by designating specific locations for food vendors and establishing health and hygiene standards. Furthermore, to minimize the practice of open-burning of agricultural waste in farms, a feasibility study for the Vigan Biomass Power System has been completed aimed at generating 1 to 2 Megawatts of electricity for the city from existing agricultural wastes. This project will further minimize the emission of particulate into the atmosphere. All of these complimentary ordinances and projects were meant not only to complement air quality controls in the city but also integral to the city’s cultural heritage vision.

4.0 Strict enforcement and public consultation and stakeholder education on environmental ordinances

Another major effort made by the city government was the conduct of continuous public consultation and stakeholder education of existing environmental ordinances. In the case of the engine conversion programme, education and information seminars to all tricycle drivers and operators on the city’s environmental regulations and ordinances and basic courtesy to visitors and passengers are conducted by the city government during renewal of their operating licenses and franchises. Letters and individual notices are sent out to all registered owners and drivers of public conveyances reminding them of their compliance period. Information and education campaigns on the city’s environmental ordinances and programmes were held in all of the LGUs public elementary and high schools as well as through barangay assemblies.

To ensure that traffic and environmental laws are fully implemented the city government beefed up its traffic enforcement capability by hiring 22 traffic enforcers, 15 security guards, 8 watchmen and 3 environmental guards to augment the city’s police force and enable them to focus on crime prevention and solution. Local youths were also deputised as environmental and ecology officers to complement deputised environmental guardians from local senior citizens’ associations.

5.0 Budgetary support for environmental services

The strength of Vigan’s air quality control programme as well as its other environmental management programmes is bolstered by the LGUs continuous allocation of annual budgetary support and resources for environmental services. Over the past five years, the city’s environmental services has continually increased from 4.12% in 2003 to 14.74% in 2007 of the total annual development funds (ADF) allocated from the city’s internal revenue allotment (IRA). For fiscal year 2007, the city government approved the allocation of 43.43% of the city’s IRA as its ADF which is more than the 20% minimum mandated under the LGC. Of the

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Aside from direct budget support for environmental services, other city departments and offices also implemented environment and resource management-related support activities and services. For example, in the case of the air quality control programme, the city's engineering and market supervision offices provide technical and physical support to the city environment office especially in the inspection of vehicles and maintenance of urban greening project in their areas of responsibility.

6.0 Community mobilisation and deputation of environmental guardians

As part of the city's effort to fully involve in the city's environmental programmes and activities, it established a unique programme for the city's elderly to become active and useful members of the community by deputising the city's senior citizen's leaders as "environmental guardians". Likewise, all city government employees are also deputised as volunteer environmental guards. These have proven to be working based on the number of apprehensions and minimized incidents of littering and vandalism. It should be noted that while fines are imposed on violators options are given for them to provide community service such as cleaning areas where they have been apprehended. In most cases violators opt to conduct a half-day community service instead of paying fines.

7.0 Environmental management plan and heritage conservation management master plan

The city's air quality control programme is directly part of a comprehensive environmental management plan (CEP) currently being prepared by the city environment office that integrates all the different aspects of the city's environmental and resource management programme¹⁷. The city's CEP shall serve as the blue print not only for the city's sustainable management of its limited resources but more so of its contribution and role in achieving the city's over-all cultural and heritage vision. The city's environmental management plan is a major component of Vigan's heritage conservation programme and master plan that was approved in 2001. The Vigan master plan identified environmental management of the city's physical, natural, cultural and human resources was identified as part of Vigan's heritage that should be conserve and preserve.

C. Benefits and Impact

1.0 Improved air quality and circulation

An environmental analysis report released by the City ENRO last July 2008 stated that the engine conversion programme has "significantly reduced" air quality problems in the central area or *poblacion* since its inception (CityENRO, 2008). However, measures of the city's air quality level were not released in the study. As of September 2008, a total 2375 TFH or around two-thirds of all the TFHs were converted or have adopted an environment-friendly technology. The monthly average compliance rate is 127 TFH per month for the period of September 2007 to September 2008. The engine conversion programme has only been fully implemented for only 18 months. By the end of 2009, all TFH that are currently licensed and operating in the city will have been retrofitted or upgraded to four stroke technology.(CityENRO, 2008)

2.0 Strict enforcement and apprehension of violators

Strict enforcement of traffic laws and clean and green ordinances led to a number of apprehensions in 2007 that include 471 cases related to anti-littering and vandalism ordinances and 86 cases of anti-noise and air pollution violations. An annual public destruction of apprehended illegal mufflers and sirens is undertaken

¹⁷ the city's air quality control, coastal resources management, solid waste management, water and sanitation/drainage, clean and green, and river and mangrove rehabilitation programmes

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in front of the city and the Vigan Public market to convey the message of the city's seriousness to enforce environmental laws.

3.0 Improved local economy and enhancement of the city's heritage conservation programme

The city's effort to reduce air emissions through the engine conversion programme and other environmental laws are seen to contribute immensely to the city's heritage conservation programme and its growing image as a primary tourist destination site in the North. Since the city's committed effort to become and create a cultural heritage city economic activities and income generated from tourist-related services, products and activities have dramatically increased. Traditional and tourism related industries continue to fuel the economy of Vigan that grew tremendously in terms of income. The estimated average increase in sales of traditional and tourism related industries was around 20-30% annually from 1995-2001.

4.0 National and regional awards and recognition

The success of Vigan's environmental management programmes, including the city's engine conversion campaign, has resulted to numerous awards and recognition for the city. From 2004-2008, the city was awarded the cleanest and greenest city in the whole region as well as the most outstanding LGU-initiated environmental management programme in 2007 and the Most Child-friendly City in Region I from 2005-2007. Its engine conversion ordinance has been reviewed by the province of Ilocos Norte for possible replication as well as in the city of Tuguegarao, Cagayan province.

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E. Sustainability

1.0 Close link of environmental management to city's future strategic vision.

The sustainability of the Vigan's air quality control programme is assured because it is anchored not on mere compliance with existing laws such as the Philippine Clean Air Act but more importantly because these measures along with other environmental management programmes being implemented in the city is directly linked and integrated to its common vision to be a cultural heritage city. In the city's Vigan Vision 2010, "enhanced environmental management" shall be needed to address environmental degradation caused by air, water, noise and coastal erosion.

In the case of the engine conversion programme, whilst the compliance period for the conversion of 2-stroke engines end by December 2009 continued compliance monitoring shall remain in place in terms of emission controls and testing that will still be conducted for all TFH and other public vehicles operating the city. Likewise air quality control remains a critical element of the city's comprehensive environmental management plan until 2010.

2.0 Strong institutional and local policy regime

Finally, the 2-stroke engine conversion and the rest of Vigan's environmental management programmes shall be sustained because of the establishment and institutionalisation of a city environment office¹⁸ and finalisation of a city comprehensive environmental management plan. A comprehensive city environmental code is likewise being prepared for approval by the city council that would lay down an overarching policy regime not only for air quality control but all other environment and resource management arrangements in the city.

3.0 Strong political leadership and strong community spirit

Vigan city's engine conversion programme is succeeding because of the strong community and political will shown by both local and community leaders. The consistent application and enforcement of the laws and apprehension of violators as well as continuous education and information campaign of the general public and local stakeholders facilitated better understanding and cooperation among all sectors.

More importantly, the LGU's drive to improve air quality in the city from the use of different regulatory measures such as the conversion of 2-stroke motorcycles to the urban greening programme to provide "breathing spaces" and pedestrianization of certain areas in the city were all self-initiated and implemented decisions made by the LGU. Very little funding support from donor or national agencies was given to support and implement Vigan's 2-stroke conversion programme. In fact, most of the its implementation, including the one-year field testing and research for alternative engine systems for motorcycles, were funded from the LGU's budget.

The same can be said of the rest of Vigan's environmental programmes. Vigan's drive to sustainably manage its environment, including local air quality, was motivated not by external or national agency influences but by a self-determined and conscious decision by Vigan's local community and its strong political leadership to become a sustainable cultural heritage city. This same self-determined motivation and aspiration is what maintains and sustains Vigan's environmental management practices.

¹⁸ The City ENRO 2 technical staff and 28 other personnel assigned to the different environmental management services being implemented in the city. These include dredging (5 staff), river rehabilitation (10 staff), solid waste management facility (10 staff) and environment officers (3 staff).

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F. Replicability

Replication of Vigan's 2-stroke engine is currently being studied and reviewed by Tuguegarao city with an estimated 15,000 tricycles operating in the city and Ilocos Norte province. The 2-stroke engine conversion is also being implemented in Puerto Princesa City. Likewise, the Envirofit (info@envirofit.org) direct injection conversion technology used in Vigan is a technology invented in Colorado State University, Denver, USA which was extensively and independently validated in the Philippines and endorsed by Clean Air Asia Initiatives that is currently available to the general public and other local government units.

G. References and Sources

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c. Digital materials and reports

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