BEST PRACTICES

NON-STATE ACTORS AND LOCAL AUTHORITIES IN DEVELOPMENT – ACTIONS IN PARTNER COUNTRIES (MULTI-COUNTRY) FOR NON-STATE ACTORS

DELGOSEA

Partnership for Democratic Local Governance in Southeast-Asia

Best Practices on Local Governance in Urban Public Service Delivery in Southeast-Asia

www.DELGOSEA.eu

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A project implemented by the consortium: Konrad-Adenauer-Stiftung e.V., Thailand Environment Institute (TEI), Local Government Development Foundation Inc. (LOGODEF), United Cities and Local Governments for Asia and Pacific (UCLG-ASPAC), Association of Indonesian Regency Governments (APKASI), Association of Cities of Vietnam (ACVN), and National League of Communes/Sangkats of the Kingdom of Cambodia (NLC/S).

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DELGOSEA aims to create a network of cities and municipalities to implement transnational local governance best practices replication across partner countries: Cambodia, Indonesia, Philippines, Thailand and Vietnam. It supports the role of Local Government Associations (LGAs) in providing and assisting the transfer and sustainability of local governance best practices replication by local governments. Most importantly, through the exchange of best practices in the region, DELGOSEA intends to contribute to the improvement of living conditions of disadvantaged groups in Southeast Asia by helping increase their participation in local planning and decision-making.

Konrad Adenauer Stiftung

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The project has five partner organizations, running the national offices in their respective countries. DELGOSEA partners are:

- ACVN, Association of Cities of Vietnam, Vietnam
- LOGODEF, Local Government Development Foundation, Philippines
- NLC/S, National League of Communes/Sangkats of the Kingdom of Cambodia, Cambodia
- TEI, Thailand Environment Institute, Thailand
- UCLG ASPAC, United Cities and Local Governments – Asia Pacific, Indonesia

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BP10	Udonthani, Thailand
BP11	Muangklang, Thailand
BP12	Marikina, Philippines
BP13	Olongapo, Philippines

Thematic Area III: Inclusive Urban Public Services

About DELGOSEA

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In the first phase of project implementation, intensive research was carried out to determine best practices (BP) in local governance in each of the five participating countries. A consortium of international local governance experts and representatives from the LGAs reviewed and selected 16 Best Practices out of the submitted 27 Best Practices.

The project concentrated on the following four thematic areas while selecting best practice examples from the five countries:

1. People's participation in planning and decision-making;
2. Institutional governance;
3. Inclusive urban public services;
4. Fiscal management and investment planning.

Starting in January 2011 through to August 2012, DELGOSEA will continue to collaborate with LGAs and local governments to transfer best practices replication. The pilot cities/municipalities could modify or improve the original best practice to their local context. The LGAs in the five participating countries will closely consult and guide the selected pilot local governments on the transfer and implementation of BP replication.

About this Publication

This publication is the third volume of a series of publications on best practices in local government in the five project countries of the DELGOSEA project. The other three volumes are:

Volume 1: People's participation in planning and decision-making;
Volume 2: Institutional Governance;
Volume 4: Fiscal management and investment planning.

These best practices were selected after a long and thorough research procedure, taking place between April and July 2010. Internationally renowned experts on local governance compiled a shortlist of 27 examples out of hundreds of submitted projects. The selection was based on the following key criteria: high transferability potential to other countries, the impact on the living conditions of the local people, institutional and financial viability as well as project sustainability.

From these 27 best practices, 16 were finally chosen for publication by a committee made up of experts and local stakeholders, including local government associations. With the help of external experts as well as resource persons from the cities featured, a detailed description and analysis of all aspects of the projects was developed, with the aim of providing comprehensive information for any other city or commune who is interested in replicating the example.

This particular volume features the four best practice examples in the area of managing local services in an urban area while paying attention to environmental factors – two each from the Philippines and Thailand. Managing urban environments in an ecologically friendly way is one of the big challenges for Southeast Asia where urbanization is proceeding fast. Each of these examplse focuses on a different aspect of environmentally aware city government - taken together, they give a rich picture of the various attempts being made in Southeast Asia to deal in a creative way with the particular problems posed by urban environments.

The electronic version of this pubication or other related publications can be downloaded at www.delgosea.eu. A hardcopy can be requested at the country office of Konrad-Adenauer-Stiftung in the Philippines - http://www.kas.de/philippinen/.

Introduction into Urban Public Service Delivery

1. Urban Environmental Issues in Southeast Asia

The 21st century saw the expansion of mega-cities with more than half of the world's population currently living in urban areas. This development, alongside globalization, increasing population growth, rapid economic expansion and technological developments has been the cause of various environmental problems, especially in many Asian cities. Such problems have been directly and seriously affecting people's lives. The extensive and rapid urbanization together with imbalanced development led to any number of environmental problems, including water, air and noise pollution, solid waste and hazardous waste, traffic congestion and the existence of slums. Social and cultural problems are also becoming increasingly serious.

For nearly all cities in Southeast Asia, the environmental problems in urban areas have become far too serious and beyond the capacity of most local governments alone to deal with. How to ensure good local governance has become one of the most pressing questions for urban development partners and citizens.

Municipalities or local governments are local administrative agencies directly responsible for the development, delivery and maintenance of public utilities, infrastructure and basic services to the urban population. Ideally, these services are of good quality so that the population can live in a healthy environment and achieve sustainable development. Every municipality or local government is the principal actor and key coordinator with other concerned agencies in dealing with its environmental development and problems. Most local governments, however, face a number of constraints and obstacles to achieve their goals because of:

- Lack of long-term vision and development strategies from local government decision makers for attaining sustainable city goals;
- The coordinating ability and efficiency of local government with other concerned agencies and partners within its own administrative boundaries and beyond is limited;
- The partnership development approach as such is not integrated into the process of city development;
- The technical knowledge and managerial capacity of local governments are limited;
- Essential data and information of local conditions are generally inadequate for supporting sustainable development projects;

- Planning and Development measures such as local development plans and comprehensive land use plans are not fully recognized and effectively implemented.

For addressing the above-mentioned constraints and limitations of most local governments, the following ten urban environmental management strategies are proposed.

1.1 Ten Strategies for Urban Environmental Management

The ten following strategies are a set of guidelines to help achieve efficient urban environmental management. These proposed strategies should not be treated as a menu to pick and choose from. On the contrary, the municipality should consciously integrate all these principles in the process of planning development activities:

1) *Self-reliance*
Urban environmental management is one of the core responsibilities of the municipality. Simply following top-down orders or blindly accepting support from central government is not enough. The municipality should think and initiate creatively to address local needs and problems.

2) *Interdependence*
Urban environmental management is a shared responsibility and needs close collaboration among local governments. The central government should be considered as a source of expertise and some finance, not as provider of services.

3) *Capacity Development*
Environmental problems are getting more difficult, more complicated and more serious. Therefore, continuous capacity building and training opportunities for municipal decision makers and staff should be supported and strengthened.

4) *Data Collection*
Efficient local service provision is not possible without good information of the existing situation and causes of the problems. Data should be properly analyzed and continuously updated.

5) *Stakeholder Partnerships*
It is advisable to use different tactics to gain more support and participation from existing local institutions such as business sectors, charity groups, non-governmental organizations and civil society in order to solve the problem.

6) *Communication*
To deal with the problem effectively, information dissemination to all concerned parties is essential. Channels of communication between the municipalities with all related bodies through a variety of media should be used and encouraged.

7) *Local Community Empowerment*
One of the best measures for environmental management is to establish a strong local community organization to take care of local problems. The municipality can support these community bodies through community education, awareness building and by providing basic financial resources.

8) *Coordination and Integration*
In order to have a sound resource mobilization, infrastructure development, and community improvement, the municipality has to play an important role in coordinating among related units not only in planning but also in implementation. Most environmental services and infrastructure are interdependent; integration of service providers in its locality is one of the fundamental tasks of the municipality.

9) *Fix and Follow-up*
The municipality needs to define clear environmental goals and work conscientiously through the process of implementing environmental management plan. Periodically, an evaluation of achievements needs to be undertaken to prepare for future action.

10) *Legal framework and enforcement*
The municipality must have solid and workable legal support and enforceable measures for its local environmental policies. Some necessary rules or by-laws should be passed by the municipal council and seriously enforced.

1.2 Management System of Urban Environment

The ten environmental management strategies are guiding implementation principles which need to be supported and managed by a good management system. A good urban environmental management system should have the following characteristics:

- The system is commonly understood and accepted;
- The system responds well to the stated policies;
- The system is focusing on preventive measures rather than damage repair;
- The system is flexible and can be adapted to any situation.

The four elements of the urban environmental management system are:

1) *Urban Environmental Policy*
   Municipal leaders should develop their environmental policies with clear goals which are endorsed by the municipal council and fully understood and accepted by the municipal staff.

2) *Organizational Structure, Personnel and Financial Resources*
   The municipality must organize itself as a centre to coordinate all activities aimed at creating a healthy and pleasant urban environment. To achieve this end, it is crucial to develop and utilize the municipality's own personnel, capital and finances.

3) *Environmental Action Plan*
   The action plan is a concrete expression of stated policies, and aligned to administrative structure, budget and personnel resources available. The planning process must start from the needs of the communities, and involve the communities in the decisionmaking. A local environmental action plan should be designed and aligned with provincial and national development plans.

4) *Legal Measures*
   Laws, rules, regulations and by-laws are all important measures to enforce and implement stated policies and agreed action plans as well as to enable the collection of service charges, and to fine or restrain violators of environmental regulations.

2. Integrated Approaches towards Urban Environmental Issues

Making a city more livable and sustainable is the ultimate goal of any city administrator. This goal should be manifested in both long-term and short-term objectives in the process of planning and development of various development activities. Livable and sustainable cities should comprise three fundamental elements, namely: human wellbeing, societal security and environmental livability. Furthermore, the three elements should also be built on the two pillars of knowledge and good governance.

Urban environmental issues can be divided into two main agendas, brown and green agenda.

Brown agenda points are:

1. Water pollution control;
2. Drainage;
3. Solid waste management;
4. Hazardous waste management;
5. Air pollution control;
6. Environmental health.

Brown agenda problems largely need to be solved immediately or in the short term by the application of known technologies and relatively simple management methods. However, these agendas remain crucial problems for most of the cities in developing countries.

Green agenda points are:

1. Transport and traffic;
2. City greening;
3. Building environment (e.g. infrastructure, landscape);
4. Slum improvement;
5. Land use planning;
6. Natural resource management;
7. Energy and man-made environment management.

Green agendas are more complex and require more commitment to long-term thinking with a better understanding of the causes of the environmental problems of the “brown agenda”. Alternatively, if the green agendas are efficiently planned and implemented, brown problems minimally occur.

All problems listed are closely interrelated and interdependent; therefore the municipality needs to approach them systematically and find the links from one problem to the others, in the short and the long term. Both the brown and the green agendas should not be treated in isolation. There is much cross-referring between and among the issues. The categorization of the issues was done for the practicality and specialty purpose of management. However, in the process of planning and development, it is necessary for municipalities and communities to think in holistically and systematically taking a broader view and an integrated approach. Nowadays, the climate change agenda has been dominating all the spheres of development activities, particularly in relation to the process of infrastructure development and the delivery of public services, through which the interdependence as well as the impacts of the brown and the green issues become even more vital.

The four best practices for inclusive urban public services which are collected and presented in the next section are only some practical experiences from a variety of mandates and development activities of the selected cities in the region for the learning and sharing purpose of local change agents.

One should relate each good practice to other good practices in the area of urban environment in order to see their connectivity and influence; at the same time, one also should not separate the environmental issues from other sets of good practices, namely, financial management. Ultimately, healthy urban environment and efficient financial management should be based on workable local governance institutions, viable partnerships and people participation.

Short Summaries of Best Practices on Good Local Governance in Urban Public Service Delivery

Summary Best Practice 10 BP | 10
Constructed Wetland for Municipal Wastewater Treatment, Udonthani, Thailand

As a response to growing population and urbanization, leading to an increase of urban sewage and contamination, the municipality of Udonthani initiated a wastewater treatment system by turning existing waterways from municipal sewers into natural treatment systems (constructed wetland). This best practice model has been set up as a supplementary system to the existing municipal wastewater treatment. Udonthani has to cope with the wastewater from 47,828 households, 11 markets, and 400 industrial plants that discharge a total of 50,000 cubic meters per day. With the constructed wetland, Udonthani managed to reduce organic compounds, nitrogen, phosphorus, metals and germs from the water while at the same time creating a recreation space for the people along the riverside.

The advantages of this best practice model are self-explanatory:

- It is easy to set up and can be adapted to different environmental conditions and purposes;
- It is cost-effective due to its natural capacity to treat water efficiently, yet with high affordability, low maintenance cost, and minimum technical dependency;
- It is sustainable by making use of natural resources to treat urban sewage and reduce contamination;
- Through the transformation into a constructed wetland, a public space with an enjoyable landscape (parks, green areas) and recreational space for the people has been created.

The urban water treatment works in Huay Mak Khaeng creek was a joint effort between Udonthani municipality, the Faculty of Engineering and the Faculty of Architecture of Khon Kaen University to survey, study and design the construction plan, under the supervising/coordinating role of the Sanitary Work Division of the municipality. The work also engaged the Social Welfare Office, which coordinates efforts with local communities, and the Public Health and Environment Office, which oversees health and environmental quality in the municipal area.

Summary Best Practice 11 BP | 11
Low Carbon City, Muangklang, Thailand

With a budget of only 1,000 Euro, the mayor of Muangklang town launched a solid waste management program which led to a significant increase of living conditions for the local people and turned the city into a liveable environment.

The following innovations have been implemented:

- A comprehensive waste management has been set up. Instead of constructing a complete building with a sophisticated incinerator, a simple outdoor conveyer belt has been used. Separable organic waste are also collected for producing compost. This led to a substantial reduction of what was daily deposited at the municipal landfill.

- Introduction of natural gas vehicles (NGV). Buses with conservative tram-like appearance have encouraged people to use public transport around town instead of private cars. This reduces overall fuel combustion.

- Improvement of water quality:
  - In the municipal market, discarded vegetable leaves and fruit peels are collected to produce EM (Effective Micro organism) concentrate. The concentrate is then used to improve the water quality of the river by adding it into the municipal sewer at different locations. The rest can be fed to animals in the municipal farm. Their manure is collected and sold;

  - The municipality also introduced grease traps with which to equip houses and shops along the riverside and in the city. Grease traps reduce the river's organic load, thus greatly improve the overall water quality of the river. Collected grease is transformed into fuel bars, which serve as supplementary fuel in the municipal slaughter house and reduce the use of firewood.

These activities were mainly funded through the local government's annual budget, with some contributions (financial and material) from private companies such as Apina Industry, National Starch and Chemical, as well as neighboring area like Rayong province, which supported the installation of grease traps in Muangklang municipality.

Summary Best Practice 12 BP | 12
Marikina Eco-Savers Project, Marikina, Philippines

The eco-savers program is Marikina city's innovative recycling scheme which promotes a culture of discipline among young people through ecological solid waste management. The name of the program 'eco-saver' implies several meanings, which include the following:

- Saver of ecological system by being aware of sound environmental practices;
- An ecological solid waste management practitioner from a household;
- Economic savings realized through recycling of garbage.

Its main features and functioning are as follows:

1. *Waste Management at Source*
   The program requires students to bring recyclable garbage from their respective households to school during an assigned Eco Day — the day when the garbage is going to be weighed and credited to their issued eco-savers passbooks. Students and parents are partners of the city government in practicing waste segregation and recycling practices at the household level

2. *Empowerment of Elementary Pupils in Ecological Solid Waste Management*
   Even at an early age, the pupils at Marikina city's public schools were given an opportunity to have meaningful involvement and influence fellow students in implementing sound ecological solid waste management practices by recovering recyclable materials from the household waste. This has become a valuable experience, instilling in them the values of discipline and concern for the environment.

3. *Promotion of Economic Benefits from Recyclables*
   This program is not only rewarding for the environment but also for the students who get points for the recyclables they bring to school. The recyclable garbage is valued according to the prevailing market price, i.e. PhP1.00 = 1 point. Points earned entitle the students to shop in the eco-savers bus, which carries educational materials such as dictionaries, books, school supplies and educational toys as well as basic commodities such as sugar, cocoa powder drink and rice.

4. *Incentive Scheme through the Eco-Savers Passbooks*
   Each student is issued the eco-savers passbook at the beginning of the school year. The student's points are credited and recorded in the passbook according to the recyclable waste materials he or she brings to school. An eco-saver who wishes to shop in the eco-savers bus only needs to present this passbook, which entitles them to exchange their points for any of the goods sold inside.

5. *Utilization of Eco-Savers Bus*
   The eco-savers bus or the mobile store is a converted city government facility which contains educational materials like dictionaries, story books, school supplies and educational toys and basic commodities such as sugar, cocoa powder drink, coffee and rice. This range of goods is exchangeable with the points secured by the students from their recyclables.

   The advantages of this best practice are easily understood:

   - It is a best practice, which addresses the current needs in solid waste management of many municipalities and, at the same time, offers an easy way to organize the handling of recyclable material;
   - It is an entirely local project, which can be managed with little municipal administrative resources;
   - It involves the population directly and at all stages, taking advantage of the power of family structures, embedded in the community;
   - It is a project that can be realized in a short period of time without requiring any particularly big public or private investment.

Summary Best Practice 13 BP | 13
Olongapo City Disaster Coordinating Council, Olongapo, Philippines

The city of Olongapo has taken initiatives for developing a disaster-preparedness program as early as the 1980s. The innovative aspect of this best practice is the centralization of crisis management with the establishment of the Disaster Management Office (DMO), as implementing arm of the Olongapo City Disaster Coordinating Council (OCDCC). This centralization led to:

- Well-coordinated actions;
- Availability of highly trained experts; and
- Fast rehabilitation in and after crisis situations.

The comprehensive program which was set up is not only designed for on-the-spot activities, but rather entails the whole management circle from mitigation to preparedness, response and rehabilitation activities. In this way, CDCC/DMO managed to evolve into a well-recognized organization committed to saving lives and properties far beyond Olongapo city boundaries. The efficient and quick functions and services of OCDCC/DMO could not have been realized without the significant support of the people living in Olongapo, the private sector and the media, as well as various partner agencies who all contributed financially or with equipment, skills, technology and resources.

Best Practice 10 | BP 10
Constructed Wetland for Municipal Wastewater Treatment, Udonthani City, Thailand

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with the full support of Thailand Environment Institute (TEI)
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Constructed Wetland for Municipal Wastewater Treatment, Udonthani City, Thailand

Section A. Best Practice Description

1. An Introduction to the Best Practice Model and its Innovative Elements

A constructed wetland imitating natural wetland ecosystems can be used alone or integrated with other water treatment systems to improve water quality.

An effective integration of constructed wetland with the main wastewater treatment system requires an understanding of freshwater ecological systems and their characteristics. It is desirable to maintain healthy freshwater ecosystems within natural creeks and wetlands as these function well as urban water drainage. The development and construction of drainage systems should, therefore, fit in with existing natural resources to enhance the architectural, social and environmental values. Furthermore, well-designed creek banks provide additional areas for the livelihoods of local communities.

Constructed wetlands increase capacity of the existing municipal wastewater treatment system to deal better with fluctuating organic loads, variable quality of wastewater intakes and climate variability. While being relatively low-cost, the systems are highly effective.

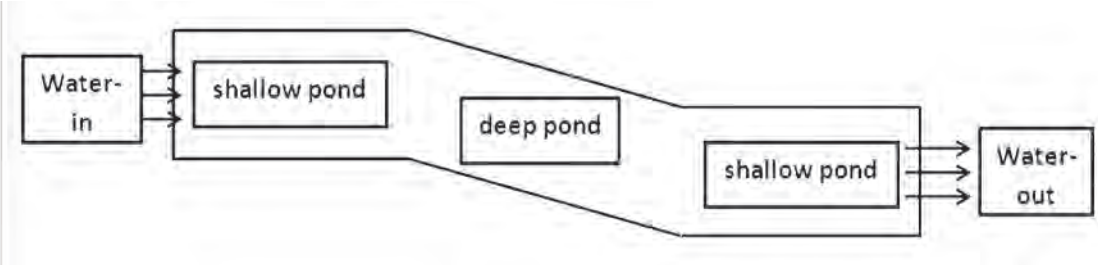

Figure 1. The diagram of the water treatment system

The diagram depicts the water treatment system with constructed wetland ecosystems, starting from the intake, which receives wastewater discharged from the municipal sewage, to the outlet, which releases treated water into natural water bodies. The system consists of shallow and deep ponds with a variety of aquatic plants resembling aquatic gardens.

The shallow pond reduces water speed and eliminates organic matters. It is cultivated with sedge, screw pine, cattail and Indian shot. Protein is also eliminated by being transformed into ammonia gas. The deep pond is cultivated with lotus and submerging plants to transform the ammonia from the previous shallow pond into nitrate (nitrification). The second shallow pond functions similar to the first one, but transforms nitrate to nitrogen (de-nitrification), which disperses into the atmosphere. The discharge goes into a nearby creek.

Picture 1: Plant diversity in the constructed wetland

The configuration of constructed wetland can be highly diversified, depending on its location and its purpose. For example, if there is limited space, it can be a single wetland with different depths and different plants at each depth. If a larger area is available, it can be a series of wetlands, each of which contains a certain type of plants.

Imitating how a natural wetland ecosystem treats water, the constructed wetland, in comparison with conventional water treatment system, is cost-effective due to its natural capacity to treat water efficiently, yet with high affordability, low maintenance cost, and minimum technical dependency. The system essentially requires only the maintenance of plant density at the appropriate level. Trimming is necessary when the aquatic plants become too dense, blocking water flow.

2. Reasons for Program Development, Shortcomings and Challenges Addressed by Best Practice Model

In 2003, two local creeks, Huay Mak Khaeng and Huay Mang, were in poor conditions with high sedimentation loads, pollution and contamination. Mr. Hanchai Teekathananond, the mayor at the time, initiated restoration and rehabilitation of both creeks, returning the water quality to the level it used to be in his childhood, for the benefits of local communities.

However, there was no appropriate model of water treatment system available locally at the time. Consequently, the mayor had to look elsewhere for a suitable system. There were also the options of using mechanical aeration and oxidation pond. Finally, a natural-based treatment system was selected, demonstrated by the Royal Department Project in Khao Hin Son in Chachoensao Province.

The initial wetland construction started on a small scale, a so-called "showroom", as a pilot project to promote public awareness of its purpose. Positive responses were expressed, particularly among the local communities within the vicinity of the constructed wetlands. The municipality then expanded the constructed wetland to cover a larger area.

The "showroom" became a demonstrative wastewater treatment system based on ecological processes. The constructed wetlands were upgraded to be part of the municipal wastewater treatment system. Currently, wastewater is primarily treated by the municipal main treatment system, goes through the constructed wetlands and is naturally treated in the final stage prior to discharge. The integrated system does not only treat water effectively, but also provides additional areas for recreation for local communities. The development of the integrated system is a win-win situation, since it has low maintenance costs while being highly beneficial for the local communities.

3. Results Achieved and Relevance to Public Life

A constructed wetland can eliminate organic load, nitrogen, phosphorus, traces of heavy metals and germs in the water, resulting in deodorization of the wastewater treated. The system increases the capacity of the existing municipal treatment system and supports the growing urbanization of Udonthani.

The load comes from 47,828 households, 11 markets, and 400 industrial plants, at a discharging rate of 50,000 cubic meters per day. The maximum capacity to treat water of the constructed wetland is 5,000 cubic meters per day, but the intake is currently at 2,000 cubic meters per day.

To assess the efficiency, the treated water discharged from the constructed wetland was collected and tested at the Science and Technology Research and Development Laboratory, Rajabhat Udonthani University. It was found that the wastewater before having been treated was dark in color and smelly but after the treatment the water became yellowish and clearer. The test for pH showed good result; pH met the standard for wastewater treatment. Biochemical Oxygen Demand; BOD test found that before the treatment the BOD was 62.50 mg/L, which exceeded the standard, but after the treatment, it was 10.08 mg/L, which met the standard (not more than 20 mg/L).

Picture 3: The color and transparency of wastewater before and after being naturally treated by the constructed wetland

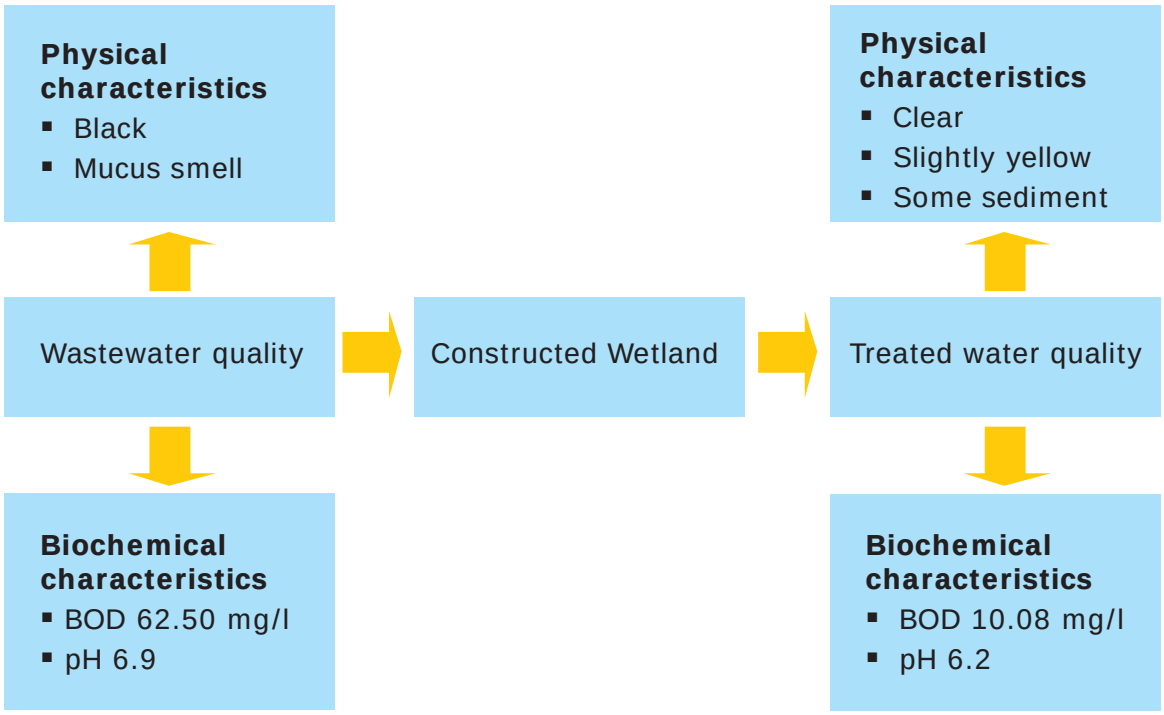

Figure 2: The physical and biochemical characteristics of wastewater before and after being naturally treated by the constructed wetland

The test results show that the constructed wetlands markedly improve urban water quality and increase capacity of the municipal wastewater treatment system. The integrated system is cost-effective and significantly improves the

quality of life for local communities, by increasing accessible recreation areas. In addition to health improvements, local communities are able to utilize different plant species for their livelihoods and to generate income. For instance, lotus flowers are picked for monk offerings, sedge is weaved into mats.

The most important outcome is the increased awareness of conservation and protection of aquatic ecosystems among the local communities. The benefits of the development have drawn great attention to the need to maintain healthy creeks with good water quality. As a consequence, the municipality aims to expand the coverage of the constructed wetlands to cover 10 kilometers of Huay Mak Khaeng, and has commissioned the Khon Kaen University to conduct studies and design.

4. Description of Udonthani Municipality

Udonthani municipality was officially established on March 14, 1933, covering 5.6 sq km. Then on December 12, 1952 the area was expanded to cover 8.3 sq km. Geographically, it is located on a plateau, 175 m above mean sea level, connected to the central plain by national highway number 2. The ground slopes down from south to north. In the municipality, there are 2 creeks: Huay Mak Khaeng and Huay Mung. They serve as natural drainage. There are 2 reservoirs as water supply sources for Udon Thani: Nong Prajak Silpakom and Nong Sim.

As of January 2010 the population of Udonthani municipality numbered 141,953 in 100 communities (excluding unregistered populations and visitors). The income and subsidy is about 1,000 million Baht per year. The mayor is elected by residents' vote according to the municipality Act 1933, 12th amendment in 2003. The present mayor is Mr.Ittiphol Triwatsuwan.

The municipality is located in Udonthani province, considered the center of northeastern Thailand with transportation networks, i.e. air, railway, highway to other regions of Thailand. It is the third largest of the northeastern provinces in terms of economic activity. According to the National Economic and Social Development Committee, Udonthani is going to be a greater Mekong sub-region service complex, i.e. a financial and commercial hub linking with Laos PDR, Republic of China, and Vietnam and becoming an export-oriented aviation hub linking to the Indochina region.

5. Budget for Best Practice Implementation

The construction of wetland consists of four phases:

1. The construction of the wetland by improving the existing creek to have designated depths and cultivating different aquatic plants as needed;

2. Carrying out pipe-laying work in order to control the intake at optimum level to the capacity of the wetland and to control the outflow in order to retain water for a certain period of time so that the plants can treat it;

3. Landscape improvement in adjacent area to the wetland for easy access and additional benefit, e.g. recreational area for local people;

4. Public relations and information sharing with local people. Allowing them to recognize the benefits from having a constructed wetland, the municipality aims for their acceptance and participation in the long-term maintenance.

The implementation of the best practice model needs technical knowledge, collaboration, a budget and time. Below some explanations:

a) Technical Knowledge

After the concept of constructed wetland for water treatment in Huay Mak Khaeng was approved by the administration, Ms.Daoroeng Hakundai, an administrative officer in the department of Sanitary Work in Udonthani municipality began by contacting Mr. Jirasak Jindaroj from the Faculty of Engineering, Khonkaen University, for initial advice. He not only offered useful advice, but also sent two engineering graduate students to help with the constructed wetland construction.

When a firm concept had been developed, there was an official Memorandum of Understanding (MoU) on a collaboration between the municipality and the Faculty of Engineering as well as the Faculty of Architecture, Khonkaen University, to study and design the constructed wetland as well as carrying out landscaping work (the administration thought it was time to renovate the creek landscape at the same time as carrying out the improvement in water quality). The team then carried out the study and designed architectural elements to improve the area along the creek. Their study included an assessment of local people's needs.

Initially the project was called "Klong Suay Nam Sai" (literally means beautiful creek, clear water) and was designed as a pilot project that took place between Prajak Silapakom and Athibadee Street, with a creek of 720 meters.

After a while, the Asian Institute of Technology (AIT) showed interest in the project and sent two graduate students to Udonthani to join in the study.

b) Collaboration

On both sides of the creek, people had settled on the land, erecting temporary houses or shops. Many of them were on plots that had been leased by the owner illegally, with settlements very close to the creek. Part of the area was also simply unused and overgrown by weeds.

Picture 4: Temporary house around Huay Mak Khaeng area

To start the pilot project, it was imperative that the municipality should ask these tenants to agree to move out, especially the ones without any official deeds or documents.

The tenants showed some understanding of the situation and were clearly explained the background to the project and its justification, objective, and benefit to the local community, such as improved landscape as recreational area, exercise grounds, and safe and convenient pathways for everybody. Eventually, they agreed to the plan and moved out.

The fact that one came to a positive and amicable arrangement with the tenants was very helpful at the end of the pilot project. The people who were still living around the area helped keeping the creek clean by picking up any drifting trash and also keeping the area in front of their house very clean. This helped to improve overall appearances of the project area and also reduced the workload of the municipality.

c) Budget

The constructed wetland functioning as a water treatment system is cost-effective with low maintenance cost. It does not need expensive advanced technology. All that is needed is the understanding of natural wetland ecosystems and the hydrological capacity of the creek.

However, some money was needed for the building works. The construction of a man-made wetland consists of two parts, 1) the wetland confinement and its ecosystem, and its depth, slope and wall and 2) the landscape surrounding the wetland.

The largest expenditure of this construction was for the preparation of the bottom and surrounding area of the wetland making different depths to allow continuous water flow.

In addition to creating varying depths, another important part is the selection of plants for cultivation as treating agent. The initially planted vegetation has to be well cared for until the plants get adapted to the new habitat.

The selection process is concerned with the compatibility of plant to the depth, using local or indigenous species, and seasonal variety in order to make the landscape more attractive. Although the landscape work is not the essence of the treatment system, a large amount of money was invested by the municipality. This was justified because local communities have expressed appreciation of the great surrounding areas of the creeks, which have been transformed into recreational areas for the benefits of the local communities. The areas have become a new green public space for social and cultural events. In turn, local residents take good care of their areas to ensure sustainability.

d) Timeframe

The concept of 'urban wastewater treatment' was new to the local community; subsequently it had taken time to gain understanding and acceptance. Udonthani spent a year providing knowledge and information about the operation and effectiveness of ecological system in treating wastewater. Despite the slow beginning, the municipality is expanding the project. The detailed plan was completed in June 2010 and the fundraising has begun.

6. Specific Technical Expertise

Different experts have been involved in the project, since a variety of skills were required. The water quality of Huay Mak Khaeng creek needed to be improved, the area around developed as a recreational site for local people and the development should help treat the sewage from the houses in town.

Ecosystem experts understand the natural behavior of a creek that continues its natural ecological process as well as treats water and have expertise in plants and plant selection in terms of type and amount to suit the intake level and maximize the efficiency.

Picture 5: Diversity of water plant in constructed wetland

Engineering experts understand the wastewater treatment system and know how to design a constructed wetland, work together with other experts from various subjects, e.g. agriculture, fisheries and architecture, to calculate the hydrological capacity of the system to operate smoothly and naturally.

Picture 6: Water diversion way in creek for divided wastewater and treated water

Architecture experts designed the surrounding areas of the creeks as recreational areas. The expertise needed is architectural design, material selection for paths and bridges to match the local setting, and landscape design to decorate the project.

Picture 7: Landscape design for recreation

At the beginning of the preliminary study, a constructed wetland was built at the municipal slaughterhouse as advised by engineering faculties. When the pilot project started at Huay Mak Khaeng, a MoU was signed between the municipality and the Faculty of Engineering and the Faculty of Architecture, Khonkaen University. Both provided experts and students to survey, design and supervise the construction done by a subcontractor.

Section B. Methodology in Design and Implementation of Best Practice

1. Brief Description of Best Practices Design Process: Initiator, Main Actor and Driving Forces

The urban water treatment in Huay Mak Khaeng creek, along with the landscape improvements to restore the natural beauty of the area, is based on engineering, architectural and agricultural knowledge. A Memorandum of Understanding (MoU) was agreed and signed with Udonthani municipality, Faculty of Engineering, and the Faculty of Architecture of Khon Kaen University, to survey, study and design the construction plan, with the responsibility for coordination lying with the Sanitary Work Division of the municipality.

Principles of the treatment:

- Nature-based, simple, neat and economical;
- Problem solved in a sustainable way;
- In harmony with the local surroundings;
- Compatible with the existing system.

The procedures before the design was completed were as follows:

1) Survey the target area to find baseline information, e.g. land periphery, land use, physical traits (embankment, size of creek, flow rate, bridge or passage), hydrological characteristics and local needs to come up with the most appropriate development plan which fits with the local environment. The project was aiming to cater for: 1) horticulture and medical herb reservoir, 2) bridge improvement, 3) exercise ground, 4) playground and 5) civic multipurpose space;

2) Design the water treatment system and hydrological aspect to balance the benefit of treatment performance and drainage capacity to meet the demand and needs of local communities appropriately. It has to be architecturally well designed to serve the town as well;

3) Design the construction, architecture and ecosystem to revive the creek and serve the town to solve environmental and social problem, promote the town, promote the quality of life and public health and to add value to the town. Led by the concept of "a creek that links people", the project aimed to create public recreational space. The design is for:

   - Balancing water treatment with hydrological characteristic purposes;
   - Converting town's sewers into a civic recreational space, changing polluted water to clear water using the surroundings as civic space;

- Promoting quality of life and public health e.g. recess, exercise (walk, jog, cycle), and other social events occasionally;

- Serving as a social path linking communities and creating unity among people living around the project so that they experience safety, ownership and participation in maintenance;

- Saving maintenance cost and fitting in with local needs.

The project to revive the Huay Mak Khaeng and Huay Mang creeks, and improve the landscape along the creeks was originated by the former mayor of Udonthani, Mr. Hanchai Teekananond. He used to work as an architect, giving him a vision and an understanding of how to design the project so that it would blend in well with the surroundings, reflecting local livelihoods, thereby maximizing public benefits.

The development was part of his campaigns to win votes in 2003. Still remembering from his childhood the creeks as a clean water source where people could bathe in and then witnessing the decline in water quality caused by, the former mayor, Mr. Hanchai Teekananond, established a research team to study ways of restoring and improving the creeks.

Mr. Daoroeng Hakundai, the Acting Director of Sanitary Work in Udonthani municipality was one staff member who studied previous cases of water treatment systems from different areas. He learned of a project of the Royal Development Project in Kao Hin Son, Chachoengsao province. The idea was brought into a discussion with his former lecturer in the Faculty of Engineering, Khon Kaen University.

When the feasibility was considered, the pilot project was set up at the municipal slaughterhouse. Then the project took place at Huay Mak Khaeng creek together with the landscape work. Sanitary Work Division was in charge of overseeing the project. The work was in collaboration with the Social Welfare Office, which coordinated with local communities, and the Public Health and Environment Office, which oversaw health and environmental quality in the municipal area.

Picture 8: The first demonstration site of constructed wetland at the slaughterhouse of Udonthani municipality

2. Functions and Roles of National Government

Because rapid urbanization was expected to continue, Udonthani municipality made a plan for a large-scale wastewater treatment system for the future, expecting its capacity to be enough for the next 20 years. The treatment plant, covering 46 hectares, is located seven km outside the town (Ban Nong Bu, Tumbon Samprao, and Ban Don Wai, Tumbon Kud Sa). In order to transport the wastewater from town to the treatment plant, it needed a water passage and the two creeks, Huay Mak Khaeng and Huay Mang, unavoidably served as sewers. The existing capacity led to water pollution, environmental, public health, social and other economic problems for Udonthani.

Therefore, wastewater treatment system was a necessity for addressing growing population and urbanization issues. Recognizing this, the administrative authorities of Udonthani approved and prioritized the Klong Suay Nam Sai project, using natural processes to treat urban sewage and reduce contamination. Not only has the project solved water pollution problems, but it also created the adjacent landscape enabling to serve as public space.

Picture 9: Water treatment outlet

The former mayor started the initiative, which was continued by Mr. Ittiphol Treewatsuwan, the present mayor, by expanding the length of the existing constructed wetland to cover more of the area along the creek. It is well supported by the same technical team of advisors from Khonkaen University who were carrying out the preliminary survey to construct the expansion phase of 9.76 kilometers in late 2009. The preparations are now finished, and the construction can begin once the budget has been finalized.

3. Brief Description of the Implementation Process, Legal and Administrative Conditions, Qualifications Process, Monitoring and Evaluation

The initial project of constructed wetland in Huay Mak Khaeng was 720 meters long and the decision to expand the project to 9.76 kilometers was based on the satisfaction with the small-scale pilot project.

A public hearing was organized, and people living along the creek gave inputs to the municipality on landscaping around the constructed wetland and the creeks. There were 20 communities joining in. A wide variety of suggestions was made, for example lighting at night, public restrooms, banning of littering into the creek, picking up trash, exercise facilities, as well as social and cultural activities, e.g. Loy Krathong festival, art and music festivals.

In the future, when the load becomes higher, the municipality has to become more stringent in enforcing existing laws, in particular regarding the use of water treatment systems by companies and organizations. Some enterprises have a water treatment system, but it is not in operation, or some of them are old and worn-out. The water quality upstream could already have been better if law enforcement was stronger.

Moreover, the neither the local government nor the municipality can handle this problem effectively by themselves. The support from different units, especially on the provincial level, such as provincial offices, in particular the provincial environment office, is needed. If the creek becomes a prioritized agenda of the province, the impact would be greater. People's participation is also an issue to promote on a practical level.

Picture 10: Utilization of open space around Huay Mak Khaeng area

4. Civil Society and Community Involvement

In the beginning, the surveyors from Khon Kaen University recorded the opinions of local communities on the pilot project at the creek, getting their suggestions regarding this improvement. Mostly, they wanted to see an improvement to the area and better water quality. At the same time, the municipality organized a public hearing, asking the residents along the creek and people living outside the area to attend. Most of them agreed to the development of the creek and its adjacent area because many spots near the creeks had become a high-risk and insecure area.

It was also assessed which part of the project should be for what purpose, e.g. exercise ground, agricultural area. More suggestions were received to increase security, such as lighting installation along the pathway.

Projections were also shown to the people living along the creek. The pictures were displayed so that they could see and compare the existing situation with the projections for how it would look like after the wetland construction. Relevant inputs were shared and incorporated into the design.

After the construction was finished, some people, especially those who live near the creek, benefitted directly, through gaining a better environment, better quality of life, more commuting options, more convenience, more attention to the creek. The place was interesting for many people, who come for a walk, to relax or have a picnic. People living next to the creek help keeping the creek clean by refraining from littering and by helping picking up the trash floating in it. They can also assist by notifying the municipality when some plants' density get too high or by trimming it themselves. There are two municipal workers to take care of the wetland.

The challenge will be to increase participation from various stakeholders when urbanization creates even more pollutants such as sewage from houses, shops, markets and factories. The more development, the more sewage occurs which affects the water quality in the creeks. Natural mechanisms alone cannot handle the problem, but residents should consider what more they can do to reduce the load at the source. Some measures should be promoted such as grease traps, on-site waste reduction, or water conservation. The collaboration between the municipality and the people is highly prioritized.

5. Role of the Media

The mass media has been helpful in propagation the movement of the construction of constructed wetland project from the very beginning, starting with picking up on the press release of the MoU between the municipality and the Faculty of Engineering, and the Faculty of Architecture, Khon Kaen University to construct the constructed wetland. This helped to raise awareness of the project in local residents. Hardly any questions were asked when the work started.

The media coverage showed additional results. The concept of wastewater treatment based on a natural system is very interesting to the general public. For example, the Asian Institute of Technology, AIT, was keen to work with the municipality through student's research. Media at the national level also helped propagate the news to a wider audience.

Invitations to conferences and exhibitions gave the opportunity to spread the concept. The municipality provided a live model to audiences for easy understanding. Consequently, requests for site visits were well received. The project then became a model for many other authorities such as Nong Samrong municipality and Ubonrat municipality in Khon Kaen. Some of these municipalities have already started the construction. Some municipalities have started to study feasibility and compatibility with their existing systems, such as Sakonnakorn municipality and Phuket municipality.

6. Types of Implementation Activities

This constructed wetland consists of three ponds:

- Shallow pond (1st pond) is cultivated with sedge, screw pine, cattail, Indian shot, etc. to reduce water speed and get rid of organic matters in the water. Protein compounds are transformed into ammonia;

- Deep pond is cultivated with lotus and submerged plants to transform the ammonia from the previous shallow pond into nitrate (nitrification);

- Shallow pond (2nd pond) is cultivated with sedge, screw pine, cattail, Indian shot, etc. to transform nitrate to nitrogen (de-nitrification) and disperse it into the air. The discharge from this part is used for fisheries purposes.

The area, which was chosen for the constructed wetland project, had various physical problems such as erosion of the banks, lack of accessibility due to over-grown weeds or no pathways. From time to time, new people came in and settled down in temporary shelters. Water in the creek was dark, smelly and unusable.

After the development, the area along the creek became a public space, with a pathway for pedestrians and small vehicles, as well as an exercise ground. The eroded bank was reinforced and the overgrown area developed. People became more interested in the creek; in particular, houses along the creek now have a new door on the side opening to the creek.

A swamp near the creek has been deepened and transformed into a reservoir with cultivated plants, functioning as natural treating system. The constructed wetland is connected by a piping system that brings in water from the creek and also discharges treated water from the wetland back to the creek. It is equipped with a flow-rate control mechanism to adjust the flow-rate.

The practical operation of the model as a treatment system:

- When some urban sewage is flowing into the creeks, it is partially treated by a constructed wetland using aquatic plant plots such as cattail, sedge and Indian shot. This pre-treatment component also serves well for ornamental purposes. In addition, gravitational cascades are added for beautiful o make the landscape more attractive and to oxygenate the water;

- Optimal discharge intake; considering that carrying capacity of a natural system for water treatment has a certain limit, the creek and the aquatic garden flows are separated. Moreover, it was also designed to prevent flooding in the rainy season.

The constructed wetland social benefits:

- It creates awareness that the general public can be of great help to the municipal staff;

- It creates public space for anyone, in the creek area or outside, to take a recess or do exercise (walk, jog, playing sports). Some people gain additional income by picking parts of aquatic plants to process and sell.

Picture 11: Additional income from aquatic plants

7. Steering Body and Coordination Mechanism

Udonthani municipality is in charge of the project, with the Sanitary Work Division in charge as it supervises the same type of work as usual. The Social Welfare Office, which coordinates with local communities, and the Public Health and Environment Office, which is in charge of health and environmental quality in the municipal area, also take part. Documentation is the responsibility of the Technical Division.

8. Sequence of Activities and Vertical and Horizontal Coordination

In 2002, the former mayor initiated the idea to restore clean water in Huay Mak Kaeng creek. He then started to gather information of available, suitable options.

In 2003, some officers were sent to the Royal Development Project in Kao Hin Son, Chachoengsao province to study the constructed wetland as an option to apply to Udonthani if they found it interesting and applicable. The issue was then discussed with technical experts at Khon Kaen University. After some time, the pilot project was set up at the municipal slaughterhouse (multiple-pond wetland)

In 2005, a MoU was signed for collaboration between the municipality and Khon Kaen Universtiy (Faculty of Engineering and Faculty of Architecture). The Asian Institute of Technology heard about the constructed wetland and sent students to help out.

In the mean time, the municipality started the work, such as preliminary study, survey and initial design of the constructed wetland, before canvassing the opinions of the general public on the development of the project. A year later, in 2006, the construction of the wetland, along with the landscape improvement took place at Huay Mak Kaeng creek in Undonthani municipal area.

In 2007-2008, the system had been initialized and one was waiting for the plants to grow and be ready so the results could be measured. In 2009, tests showed clean and clear water as a result of the wetland. In 2009-2010, the expansion of the project was planned to cover another 9.76 km2.

Section C. Evaluation of the Best Practice Model

1. Sustainability of the Model

The constructed wetlands imitate natural ecological systems using indigenous aquatic plants to absorb chemicals while a well-designed hydrological scheme ensures circulation of the water.

Financially, especially the system is low-maintenance, since no sophisticated equipment is used. This helps to ensure the sustainability of the project.

The wetland is nearly a maintenance-free treatment system. Once it gets started, it can naturally operate on its own. There is no need for technical assistance or repairs, one only needs to ensure the optimal quantity and diversity of plants to prevent water circulation blockage. Participation of local communities can help maintain the system.

2. Major Success Factors of Udonthani's Best Practice Model

Success factors can be seen in 2 aspects:

- Necessity – goal and human resources;
- Simplicity – the wetland itself.

Necessity

The success of this project as a water treatment system and as a social tool to raise livability of the city is supported by:

- *Vision of the administrator and continuity of work*

  In this case, both the former and present mayor used to work together as a team since the project started in 2005. They play very important roles making decisions and allowing the subordinates to thoroughly understand this system. The constructed wetland is a new tool for urban wastewater treatment in an urbanized area, and its performance is rarely demonstrated anywhere in Thailand. Without the mayor's courage to try it, confidence in technical knowledge, and patience to see the success, it would have been nearly impossible.

  The continuity of work on this project was also a big part of success. The work passed down from the former mayor to the present one, directly supports the progress and leads to success. It is truly beneficial to the general public.

- *Enthusiasm and initiative*
  The initial idea of the project was to improve water quality and return the creek to the clean state it used to have. Without hard-working, zealous, and creative staff, it would not have been possible to link the experience from study-tours to the practical project work in Huay Mak Kaeng creek, including solving physical problems to start the project.

- *Professional technical teamwork*
  With a personal connection between the municipality's key person in charge of the project and the faculty team from Khon Kaen University, the close collaboration based on such mutual trust results in fast progressive work and finally a success. In addition, the integration of different technical expertise can empower the project to yield the utmost benefit.

Simplicity

The constructed wetland is a simple system that utilizes locally available resources. It is easy to establish and to maintain. It does not require sophisticated technology, manpower, time or a big budget. Yet, its performance is obviously acceptable.

Furthermore, the objective of the project was not only to treat water, but also to benefit local communities by providing a public space for recreational and exercising activities, a good environment to live in, and subtle economic benefits. It was truly interesting and attractive to invest in, comparing the overall low cost to the multiple benefits and sustainable efficiency.

3. Major Challenges and Obstacles of Udonthani's Best Practice Model

- Vision of the administrator and continuity of policy, including consistent support. Because the constructed wetland is relatively low-cost and seems insignificant, local authorities in general often neglect it;

- Confidence in the wetland. The wetland is a natural system and takes time to yield the water treatment result. It can also be affected by other natural factors, which can influence the performance such as extraordinary surface run-off, heavy influx, etc. Both affect the treating efficiency of the wetland. Therefore, the comprehensive hydrological design and plant type and population size design are key challenges;

- Appropriate configuration: The selection of wetland configuration, i.e. either single or allied wetlands;

- Application: The participation of the residents in municipal area is needed to reduce the load by installing grease traps etc. to the system.

4. Why This Model is Viewed as Best Practice

The integrated system applies natural mechanisms to treat water. It is simple, economical and cost effective, with low construction and maintenance costs. It can be integrated into the existing wastewater treatment system. It is sustainable and works with minimal effect on climate change. It adds aesthetic value to the place and mental value to people's mind. It harmonizes with the local livelihood, and sometimes generates subtle income for the local population, increasing quality of life and also adds a green area to the city.

5. Udonthani's Best Practice Transfer And Replication Adaptability

Financially, the wetland has low construction and maintenance costs and is highly effective and efficient. As a water treatment system, it treats naturally, absorbs heavy metal and nutrient loads, and it helps stabilize the main wastewater treatment system and increase resilience. Various uses: the wetland can be regarded as green area of the town, providing public spaces for rest and exercises. Other municipalities, such as Nong Samrong municipality and Ubonrat municipality, have applied the model to their water treatment systems.

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Low Carbon City, Muangklang, Thailand

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Low Carbon City, Muangklang, Thailand

Section A. Description of Best Practice

1. An Introduction to the Best Practice Model and its Innovative Elements

Muangklang municipality aims to achieve knowledge-based and balanced urban development, with people participation based on sound awareness and understanding of the issues involved. Therefore, Muangklang municipality seeks a comprehensive way to become and remain a “clean and green”, low-emission and environmentally friendly city, alongside its basic duty and responsibility as a “municipality” for appropriate development and optimal modernization.

Muangklang municipality has implemented a number of initiatives to solve urban problems in a complete and holistic way. All initiatives follow the four guiding strategies:

1) City of Trees;
2) City of Waste Minimization;
3) City of Energy Efficiency;
4) City of Sustainable Consumption.

Each initiative under these four strategies is not a total solution to a problem; all initiatives are, in fact, interrelated. Taking a systematic look at the whole best practice model, one can see the relationship among them and the synergy effects that exist.

A short list of initiatives is shown here before getting down to the details:

1. *City of Trees*
   - Promotion of planting trees around town;
   - Turning trash into trees;
   - Increasing the green area;
   - Motivating people to plant trees.

2. *City of Waste Minimization*

   a.) Solid waste management:
   - Setting up a municipal waste separation center;
   - Collecting markets’ organic waste;
   - Animal farm in town;
   - Reduce, reuse, recycle;
   - Landfill management;
   - School recycling program;
   - Reducing bins.

b.) Water Quality Management:

- River conservation;
- Grease trap;
- Effective micro organism (EM);
- Stakeholder collaboration;
- Public relations;
- River monitoring program;
- Dredging;
- Waterway resurrection.

3. *City of Energy Efficiency*
   - Office buildings improvements;
   - Energy saving campaign;
   - Fuel saving campaign;
   - Renovation of public water system;
   - ISO 14001;
   - Traffic control and re-design;
   - NGV bus;
   - Non-motorized route;
   - Reduction of truck trips to the landfill site;
   - Bio-gas and alternative fuel production;
   - Compost, EM and biogas.

4. *City of Sustainable Consumption*
   - Urban agriculture;
   - Backyard organic vegetables;
   - City of rice;
   - Rabbit, goat and pig, and their manure;
   - EM and Compost;
   - Slaughterhouse waste;
   - Black gold.

5. *Quality of Life Promotion*
   - Making merit in the river,
   - Municipal sports complex and recreational area;
   - Cultural conservation and promotion.

1.1 Detailed Description of the Four Initiatives

1.1.1 City of Trees

- **Promotion of Planting Trees around Town**
  More and more trees are being planted. Muangklang municipality has by now more green spaces per head than the average Thai town and city, but it's still a work in progress. At present, there are 6,456 perennial trees in the municipal area and the number of tree is increasing by 5-10% annually.

Knowing how good trees are for quality of life, the municipality is not only planting trees on public soil but also planting trees on any private property that gives permission for tree planting, in order to increase as much as possible the green area which is functioning as a carbon sink.

All seedlings and organic fertilizers are locally produced in Muangklang municipality.

Picture 1. Planting trees on roadsides

- **Turning Trash into Trees**

  A vacant space in any municipal area can easily become a dumping spot; some people may throw household trash, construction waste or green waste like trimmed branches, etc. there, and it is not unusual to see a heap of trash in a vacant space.

  Any empty space in the municipality area is, therefore, immediately planted with trees. Planting various kind of trees helps to increase the green area and, at the same time, prevents trash dumping; it makes people think twice before doing so. Trees not only look good, but also keep the city clean and green and help topsoil conservation.

  The increase of trees not only decorates the town but also helps absorb carbon dioxide for photosynthesis. Therefore, the trees help in air purification.

Picture 2. Tree planting in weeded vacant urban area

- **Increasing the Green Area**

  The strategies to increase green area are as follow:

  - Land use administration: A master plan for municipal land use exists, so that only the reinforcement of this plan needs to be intensified. It is a preventive measure in order to have an organized urbanization;

  - "Trees anywhere": the municipality urges every house, school and temple with available space to plant trees;

  - "Replace trash by trees": the municipality planted some ornamental trees on roadsides, wher e the planted trees control weeds and also reduce littering along the roadsides;

  - Long-term planning: the number of trees to be planted each year is decided in advance with consideration given to the appropriate variety and method to maximize success;

  - Collaboration: the municipality makes young trees available for anyone to plant. Local children are hired to produce seedlings in their free time to gain some income while absorbing the concept of green spaces in their minds;

  - Find urban civil space: continuously the municipality is trying to increase the amount of land for public use, so that in the long run, the green area for recreation and sports will be increased.

Picture 3. More urban public spaces become green

- **Motivating People to Plant Trees**

  To be successful in this campaign, motivating the general public to lend a hand is essential. Public participation is the key that cannot be ignored, no matter how hard the task is. Therefore, the municipality has tried to:

  1. Enhance the quality and usefulness of the green area development and to convince people of the good intentions and commitment of the city. In that way, people can see that the municipal efforts have good results;

  2. Enhance people's participation, from the beginning to the administration of the green area;

  3. Find more optional green, i.e. find the most appropriate green area usage such as urban agriculture, edible plants, etc.;

  4. Share the benefit from the green areas as much as possible.

Picture 4. Planting trees as a common public activity

1.1.2. City of Waste Minimization

a.) Solid Waste Management

- **Setting Up a Municipal Waste Separation Center**

  Everyday, tons of municipal waste is generated, filling up the out of town landfill site. Simple waste separation prior to landfill can reduce the amount of daily waste going to the landfill by more than half. This effort is taking place at the municipality service compound.

  Instead of investing a large amount of money into a modern waste management building with sophisticated separation system, electronic control, mechanical tools, plus a wastewater treatment section in it, a low-cost, simple "conveyer belt" is set up in the middle of the Muangklang municipality service compound.

  The belt is 14 meters long and set in a tilted position on a 4 by 24 meters concrete ground, with a peripheral trench and a simple roof. It can handle 6-8 tons of waste per day (equivalent to 3 trucks). The waste enters the belt at the lower end and moves toward the higher end, where it drops into the trunk of a truck.

  All daily garbage collected by the municipal trucks goes on the belt at the lower end. While moving up on the belt, recyclable, organic and degradable waste is picked out by a number of belt workers standing on both sides of the belt, while the rest of the waste drops into a truck, heading for the municipal landfill. This process greatly reduces daily disposal volume and number of truck-trips to the pit.

Picture 5a. Waste separation on a belt

Picture 5b. Some items picked out and the rest goes to landfill

On average, there are five trucks of municipal waste every day. Due to manpower limitation, three of these five trucks can come to the belt. From three trucks, after the separating process at the belt, 90% goes to the landfill site and 10% is separated out. Most of this is perishable waste that can be used in compost production. Some 17% is recyclable, so it is sold and part of the income is paid back to workers as daily wage and some as incentive.

The separation center is the hub, small but vital, to other waste-minimization related activities. The center takes in municipal solid waste and transforms the majority of it into materials from which to make other 'value-added' products. Almost every bit of waste collected here is turned into a valuable, income-generating or practically useful product.

- **Collecting Market's Organic Waste**

  The municipal market, or fresh market, is a simple open-air market with many local vendors. At the municipal market, fresh commodities e.g. fresh meat, fruits and vegetables, are daily brought in early in the mornings.

  Those fruits and vegetables are not packaged like those in western supermarkets. They come directly from the wholesale market. Retail venders at the municipal market have to peel off the outer parts of certain vegetables, discard bad fruits or damaged parts of fruits. Some shops prepare fruits by peeling them off and cutting them into slices before packing a ready-to-eat set.

In addition, all food vendors have to cook. In preparation of the cooking, fresh vegetables are sorted, cut and sliced. Many unused vegetables are discarded. Moreover, at the end of the day, there is always leftover or discarded food that is thrown away. These shops create a large amount of fresh food waste every day.

Picture 6. Fruit peels from fresh market

The on-site waste management takes place here by the collaboration of vendors of Muangklang municipal market in gathering all the waste. After the market ends each day, the collected waste is given to the municipal collector who transports this waste to the separation center. Most of it can be used instantly in the making of EM (effective micro organism) concentrate and by feeding to the animals. (The latter 2 processes will be explained later)

- **Animal Farm in Town**

  There are tons of green waste every day, for example, discarded fruit and vegetable from the market, mowed grass from offices' lawns in town, trimmed leaves on municipal street sides or gardens, cut branches from houses. The mentioned material makes perfect feed for some animals that are kept in the waste separation center compound.

  - *Rabbits*

    These animals eat a lot of green stuff each day! Rabbits can feed on any kind of green vegetable, either discarded before being displayed at a stall, before cooking or after the day ends. Rabbits live in a large group, so they can take in lots of green waste per day. Moreover, they are good at reproduction, being

matured after only four months, and yield many of offspring. In a well-confined space, the rabbits are ready to take care of municipal green stuff.

- *Cows*

  Nowadays, cows grazing on the ground might be difficult to find around town. Cows can eat tons of discarded fruits, fruit peels, mowed grass and even trimmed leaves. A lot of such waste comes into the municipal compound every day.

- *Goats*

  Goat eat various kinds of food, or almost all organic stuff, just like or even better than cows.

Picture 7. Goats feed on most organics

- *Pigs*

  Indigenous pigs are kept in a pen and fed with fruit, vegetable, and leftover food.

Picture 8. Pigs are 'living mills' mincing tons of green waste daily

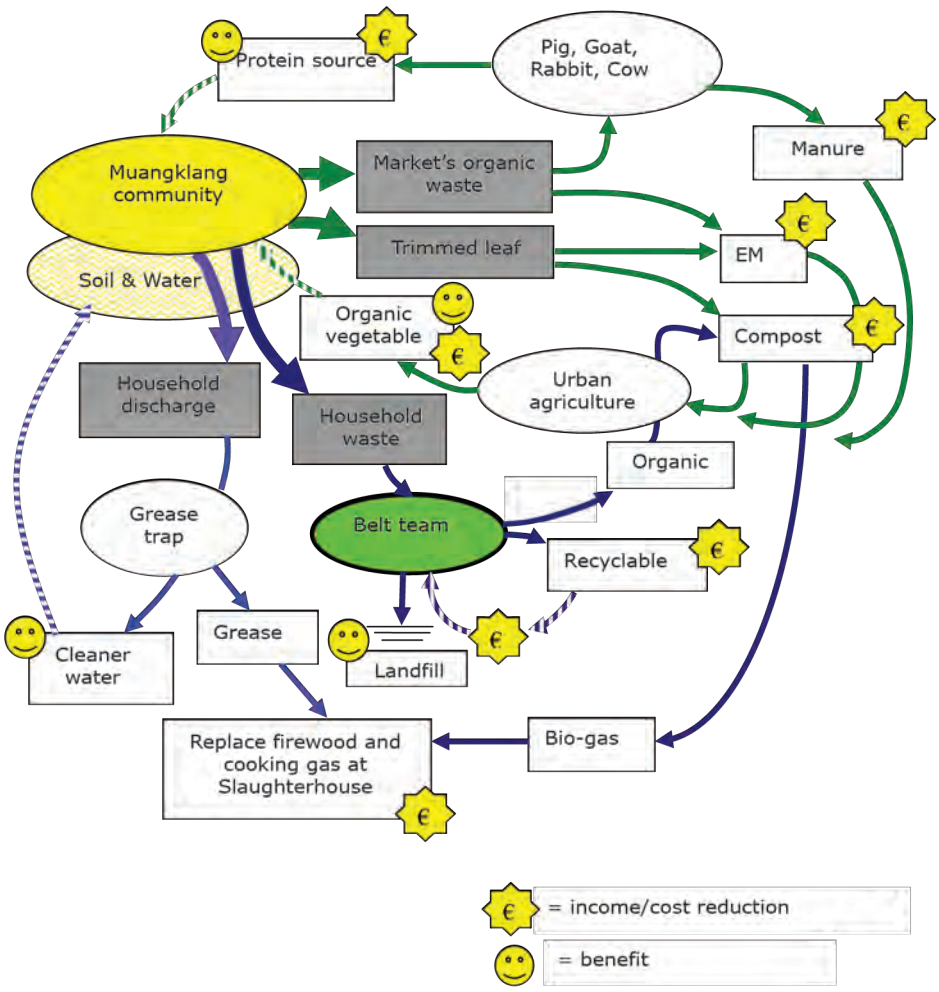
Furthermore, the excrements of these animals can also be used for many things. Cow drops can be used for fuel (mixed with grease collected from grease traps) and biogas production. Rabbit and goat drops in granule shape are good and ready-to-use fertilizers. Pig's drop is on the pen's ground laid with straw, which is turned over every day by the pigs' behavior in such a way that the drop and the straw are mixed together. On top of that, EM is added to help decompose the mixture. This makes excellent fertilizer that the fruit farmers cannot resist.

- **Comprehensive Waste Minimization Scheme**

  It is very important to see the links among the initiatives of waste minimization in Muangklang municipality (some elements have not yet been described).

  The community generates various kinds of waste, publicly or individually. Each type of waste goes through various processes and eventually turns beneficial, cost-reducing or income-generating. At the end of the line, waste has become valuable in Muangklang municipality.

Illustration 1. Muangklang's Best Practice of Waste Minimization



- **Reduce, Reuse, Recycle**
  This green idea is being promoted through various media, e.g. local radio, leaflet, website, schools etc. At municipal level, these three methods are being carried out. Organic waste is being used for value-added initiative, for example, organic waste goes to compost, market green waste goes to the demonstration farm, etc. Recyclable waste is separated and becomes eventually recycled. Daily waste disposal to municipal landfill is being reduced.

- **Landfill Management**
  The municipal landfill site is owned by Muangklang municipality. Other local authorities are using this site, paying an annual disposal charge to the municipality. One reason for the disposal charge is that it is a signal to the users to think about reducing their waste, otherwise their payment will increase. The income raised from the disposal charge is spent at the belt to augment the capacity of waste separation so that the content of all five daily trucks can be put on the belt (instead of only three due to limited manpower).

  The charge is currently as shown below;

1. Governmental organizations	670 B./ton*
2. Local private organizations	
First 50 ton	500 B./ton
50.1-100 tons	550 B./ton
100.1 tons or above	600 B./ton
3. Other private organizations	
First 50 ton	550 B./ton
50.1-100 tons	600 B./ton
100.1 tons or above	650 B./ton

  *as of June 1st, 2010

  The landfill site is well managed and often shown to visitors who come for a study tour of solid waste management. The site has to be well maintained and look fairly organized at all times, leading to increased orderliness, cleanliness and efficiency.

Picture 9. Muangklang's municipal landfill site

- **School Recycling Program**

  Not only the municipality, but also school children are joining into the solid waste management program.

  Trainers are sent from Muangklang municipality to participating schools to educate and show students and teachers how to separate school waste. Participating schools are encouraged to separate recyclable waste and sell them for income generation.

  To encourage and support this environmentally friendly practice of the local schools, the municipality pays additionally 1 Baht on top of each kilogram of recyclable waste sold. This measure effectively reduces the amount of solid waste on site.

Picture 10. Participating students with their separated trash

- **Reducing Bins**

  The more bins, the more trash. This belief could be true. The municipality reduced the number of trash bins in public places, especially in residential areas, in the hope that people would become more responsible and think twice before littering, or even before that, think twice before generating waste.

  Instead ending up with overloaded, smelly, unpleasant bins, the municipality cut down the number of trash bins and asked the residents to properly lay their trash bags in front of their house where the bags are collected punctually.

  Corresponding improvements on the punctuality of routine trash collections were implemented, making sure that no trash bags and bins are left or overloaded and create a nuisance.

b.) Water Quality Management

- **River Conservation**

The Prasae River flows through the town to the Gulf of Thailand. It has become one of the town's symbols because it has been a vital to the town in every way.

In early days, the transportation was by sea and the river was essential for linking the town to various remote destinations, for example, Bangkok. Moreover, commuting within the town and around it mainly relied on the river since it took place by boat.

After land transportation became more popular a few decades ago, along with the construction of roads and introduction of cars and trucks, the river's role in the town has declined. Eventually, it became a sewer, taking sewage from communities along its banks, causing it to become polluted and shallower.

The present mayor of Muangklang municipality, since his inauguration in 2001, has been consistently working on conservation measures for the river, not only with outside institutions but also with the local communities to get the river cleaned up and back in shape. The rehabilitation of the river is one of his first few urgent missions. His strategies as follows:

Picture 11. River conservation consists of various initiatives

Strategy 1. Partnership and Promotion of Participation

By identifying stakeholders of the river, conservation groups can be formed and periodic meetings take place among them to discuss the existing problems of the river. The results of these meetings feed into the short- and long-term planning of the municipality.

Strategy 2. Awareness Building through Media

A radio channel and a gazette are established to propagate the message of why and how to rehabilitate the river. Other activities took place as well, such as the promotion of youth camps on conservation topics or the establishment of a river monitoring program.

Strategy 3. River Conservation and Income Generation

To balance river conservation with income generation from the conservation activity was a key to its success. People cannot concentrate much on environmental issues before their basic needs are fulfilled. Local residents along the river are encouraged to make a living, but in an environmentally friendly way. For example, eco-tourism is promoted. Those who have boats can make additional money by boating people out for river sightseeing. Fishermen are encouraged to try coastal aquaculture e.g. floating fish cages to create additional income.

Strategy 4. Appropriate Technology

For sustainable river conservation, a fixed but simple household appliance has been introduced: a grease trap. This is also applied to restaurants to make sure that sewage from communities is at least somewhat cleaned before it reaches the river. All new houses are obliged to install a grease trap before they can be officially registered.

In addition, an effective concentrate of micro organism is added to the drainage in the municipal area so that the discharge is partly treated before it reaches the river.

Water quality monitoring is blended into school activities. Students are trained to do simple monitoring work to sharpen their science knowledge and to create awareness on river conservation. The schools regularly hand in water quality monitoring reports.

Strategy 5. Networking

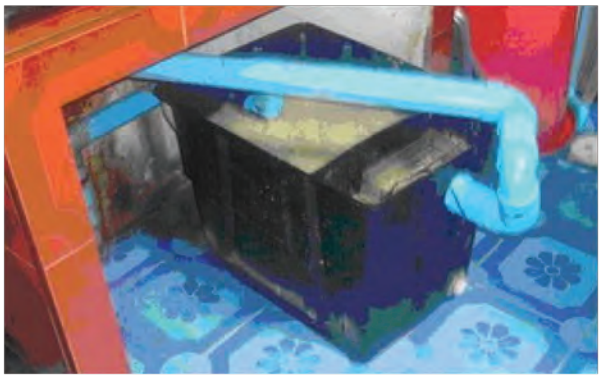
Along the river, there are a few more neighboring local authorities who can become part of an alliance for river conservation. On top of local authorities, private companies and factories located around Muangklang and this watershed are requested to join the network where they can share their own resources for the river conservation.

To look into some details of the strategies mentioned above, here is more information about prominent elements:

- **Grease Trap**

The Prasae River has been taking sewage from houses, shops and markets, as the municipality is located along its banks. The daily discharge is full of organic compound from human activities. This definitely goes beyond the carrying capacity of the river, causing the river's water quality to decline.

In order to reduce the massive organic load, the municipality introduced "grease traps" to new houses and other buildings. To abide with the municipal regulation, all new buildings along the river must be equipped with grease traps. Some existing houses and shops also participated in that scheme for the sake of the river conservation.



Picture 12. Grease trap installed under a washing sink

Picture 13. Grease collection simply by hand-scoop

The installation of grease traps can greatly reduce grease and oil load in the river. Participants can clearly see how much grease and oil they had been dumping into the river by seeing the trapped grease.

This invention immediately generates awareness of how residents were unintentionally harming the river. The trapped grease is collected by the municipal staff and then used as supplementary fuel at the municipality's slaughterhouse.

Picture 14. Trapped grease is used as additional fuel at slaughterhouse

- **Effective Micro organism (EM)**

Effective micro organism (EM) has been well known in Thailand for many years because of its universal benefit.

Particularly, EM helps reduce organic matters very effectively. A certain amount of EM concentrate (in liquid form) is simply diluted and applied in order to reduce unpleasant smells in a very fast and effective way. This biological cleaner is far less expensive than chemical cleaning agents from the supermarket, and is certainly more environmentally friendly.

EM was initially in use for water quality improvement in Prasae River. At present, EM concentrate, locally produced from municipal garbage and organic waste, is being added into the drainage at different locations across town daily. This micro organism effectively reduces excessive nutrients in the sewage, treating it even before it reaches the river.

Picture 15. EM treats sewage before it finally goes into the river

- **Stakeholder Collaboration**
  The Prasae River Conservation Group consists of all stakeholders in the city. A number of meetings among the members of this group took place to discuss the problem and possible solutions as well as proposing some activities for the municipality's 3-year development plan.

  Moreover, the municipality seeks collaboration and shares information with other local authorities located along Prasae River to form a network for river conservation.

- **Public Relations**
  The municipality continuously promotes both the river conservation to the local residents and eco-tourism programs around Prasae River to visitors including boat trips, fireflies watching, a home stay, etc. Furthermore, it publishes a monthly gazette, "Rak Nam Prasae" or "Love Prasae River" and also established a local radio channel to inform local people about the river conservation project.

- **River Monitoring Program**
  A very effective way to conserve the river in a long run is to train young residents into river inspectors.

  By using a proven ecological and biological based method, students are intensively trained to assess basic information of the river such as pH, DO, temperature, velocity, color, odor, and biological traits including any animals found on site. A systematic training series took place and monitoring continued after the

training sessions, with schools along the river taking responsibility for it. These schools make up a large and effective network to monitor water quality and the information gained is regularly published in local publications.

Picture 16. Students in training to use river monitoring equipment

Picture 17. Students are sampling water in the river

- **Dredging**

The dredging of the Prasae River has finally become necessary after the river has been getting shallower by through carrying sewage from the communities, bringing sand, clay and silt washed down from the road surface. The shallower river allowed less water recirculation in the river, causing poorer water quality.

Picture 18. The river is being dredged

- **Waterway Resurrection**

  After years and years of land transportation development, i.e. road construction, and motorized land transport's popularity, commuting by boat has been virtually forgotten.

  In the past, many towns in Thailand, large or small, had plenty of waterways that they used as roads, with people moving around by rowing boat. At present, the river serves as municipal discharge.

  Muangklang municipality brings back an old fashion commuting method, i.e. by boat, by improving piers and related facilities and promoting boat tours to tourist attractions along Prasae River. The boat tour not only generates income for the boat owners but also increases people's awareness of river conservation.

  For example, a boat trip program is shown here:

Route :	Muangklang-Prasae
Passenger :	6 passengers/boat
Fare :	100 B./passenger
Duration of a trip :	1 hour 20 minutes
Duration of round trip :	3 hours
Passenger limit :	120 persons per group per time
Attractions :	Ton Pho pier, mangrove swamp and local livelihood, cranes and water fowls, Prince Chumphon Ket Udomsak statue, Prasae M.V. battle ship, Sommuttithep Thapanaram temple, Marine turtle conservation center at Koh Mun Nai island (optional/ to make contact in advance), night sightseeing for firefly (optional)

  The municipality also promotes water transport through, for example, providing a free boat ride from the downtown pier to the new recreational and sports center. This encourages people to go there via boat rather than by car or motorcycle. Clearly, this promotion of water transport greatly helps to reduce private car use.

1.1.3 City of Energy Efficiency

- **Office Buildings Improvements**
  At the office buildings of the municipality, professional electricians were hired to investigate the building and come up with possible energy-saving measures. For instance, replacing old light bulbs with energy-saver ones, adding reflectors at all lighting points, using string switch at each lighting point for local control, etc. These measures can reduce electricity consumption and the action raises the awareness of officers in energy conservation.

  In particular, the municipality aims to be a model of energy conservation by collecting data of electricity bills and organizing training with pre-tests. The training aims to increase the knowledge of the participants. Not only the municipal officers are taking part in it, but the training also expands to a number of schools in the municipality, so that children can learn about energy conservation.

  Last but not least, the municipal office can always be shown as an example for energy conservation.

- **Energy Saving Campaign**
  Municipal offices attend this program and all staff are encouraged to reduce their electricity bill (a year's accumulative) by these measures:

  - Educate staff and make them aware of the energy-saving campaign by putting a sticker onto each switch so they can read it each time they use it;
  - Provide individual on-off lighting switches as much as possible so the lights are turned on locally and only where necessary;
  - Designated air conditioner operating time is 09.00-11.30 h in the morning and 13.30-16.00 h in the afternoon;
  - Monthly air conditioner filters clean up;
  - Check up of air conditioner units every 6 months;
  - Replacement of defective electric devices;
  - Only one water boiler is allowed on one office floor.

- **Fuel Saving Campaign**
  A campaign to reduce fuel used by the municipality was aimed at cutting down fuel cost and to be a model on this issue.

  The process started by announcing the policy to staff and by setting up jointly agreed objectives. They joined forces to plan and manage the vehicle use in daily activities, increased car use efficiency, and monitored the plan. The goal was to reduce greenhouse gases from fossil fuel combustion.

- **Renovation of Public Water System**
  In order to produce enough tap water for household use and to reduce the energy consumed in the production process, the municipality improved the production system.

  The public waterworks staff was re-educated and all equipment was checked. Regular maintenance of equipment was then emphasized. Moreover, a new water tower was constructed to increase water pressure yet reduce electricity cost for pumping. After a year, it was found that the electricity consumption (unit per cubic meter of water produced) was reduced satisfyingly.

- **ISO 14001**
  Aiming to develop a better working attitude of the municipal officers and to improve the efficiency of Muangklang municipality's service, the introduction of a standard for energy and environmental management took place in 2001.

  The introduction of ISO 14001 was a whole new start for the municipal staff to improve their way of working and thinking, focusing on energy and environmental conservation as a common goal, which benefits not only them but the public in general.

  The process has made the staff work with more teamwork spirit. They consistently sit together to talk, revise, analyze, discuss, monitor and improve their work results, which helps them improve their performance, eventually resulting in better service.

  It can be assumed that the introduction of this performance standard not only takes effect individually but also publicly. The ISO 14001 is certified by the Thailand Institute of Scientific and Technological Research.

- **Traffic Control and Re-design**

  The town in 100 years old and faces the same problem as any old town does: traffic congestion due to narrow streets.

  In Muangklang municipality traffic problem have also been compounded by the increase of vehicles in town. Traffic congestion leads to fuel wastage and the unnecessary generation of greenhouse gases. It causes air pollution, noise pollution and disturbs urban residents.

  Muangklang municipality has, therefore, taken actions to control the urban traffic by reinforcing traffic rules and regulations, for example, the non-parking area and one-way streets, or even adding more regulations and re-designing some routes. The aim is to improve the traffic flow, particularly in the rush hour, reducing fuel waste, air pollution and stress for the residents.

- **Natural Gas Vehicle (NGV) Bus**

  In a small town like Muangklang, with its century-old town's layout and an increasing population, it is not unusual to find traffic congestion during the rush hour.

  People who can afford a private car or a motorcycle do not hesitate to buy one or even both, which has led to the increase in congestion, leading to the aforementioned problems of air pollution and a decline in the quality of life.

  A very practical solution to solve traffic congestion is public transport in and around the municipal area. Muangklang municipality therefore promotes free-of-charge public transport for the residents. Instead of using private cars in and around the town, compressed natural gas (Natural Gas Vehicle: NGV) public buses with a conservative tram-like appearance are have been introduced. This initiative helps reduce the daily traffic problems, air pollution, total fossil fuel combustion and greenhouse gases generation, thereby improving the quality of life of the people.

  In 2003, the Thailand Environment Institute (TEI) invited Muangklang municipality to participate in a program called Cities for Climate Change Program (CCP) by the Local Government for Sustainability Institute (ICLEI). The program's aim is that every city understands the human activities that contribute largely to the problem of climate change, i.e. electricity consumption and fuel combustion for land transport. The goal is for all cities to collaborate in mitigating the situation.

  At the beginning, the municipality counted the number of vehicles in the municipal area and calculated the carbon dioxide gas generated from those vehicles. The number of vehicles was then projected into

the future to predict how much carbon dioxide gas would be generated. The model made us realize how the city's growth can harm our planet. Therefore, mitigating measures had to be initiated to start reducing the gas that harms us in the near future.

Using an NGV bus for public transport was one of the measures Muangklang selected. Initial target groups were the elderly, who go to do some exercise at the sports complex, and the students who go to school. The additional benefit is the increased safety and decreased daily expense. The operation time was from 5 to 7 in the morning and from 4 to 6 in the evening every day except Sunday. Then the schedule for students was launched. After an evaluation, Muangklang municipality aims to expand the service area to a larger coverage.

The bus also provides a service to groups visiting Muangklang.

Picture 19. Muangklang NGV public bus in action

- **Non-motorized Route**

However, public transport was also needed for routes out of town, especially to the new municipal sports complex.

The mayor launched a new service, connecting the town to the new, very green, complex – keeping with the idea of being 'green', the bus takes a scenic route to reach the complex. The NGV buses provide free round-trip service from town to the sports complex each day in the evening. People can leave their cars and motorcycles back at home and take the bus to do exercise.

After having dredged the river, it became possible to operate a boat service from town to the sports complex as another transport option. Embarkation is at one of the renovated piers in the middle of town. Taking a boat to the sports complex sounds classic, and it is surely a green idea since it helps reduce car use.

On top of that, no addition parking lot will be constructed at the sports complex. To support the use of NGV buses and boats, car park will be limited.

Picture 20. Non-motorized route promotion

- **Biogas and Alternative Fuel Production**

  At the municipal waste separation ground, recyclable trash is picked out as well as green, organic waste. The latter is used for compost production.

  The by-product of compost production is an inflammable gas called methane. Methane from the compost production provides enough biogas to serve the needs of the municipal slaughterhouse that operates daily (at night). The use of biogas greatly reduces the use of firewood.

  In addition, grease and oil collected from a number of restaurants in town by grease traps can be used as substitute fuel as well.

Picture 21. A bio-gas production tank

- **Compost, EM and Biogas**

  Organic waste is daily separated from the rest of the garbage on the conveyer belt and used in the production of compost.

  To produce compost, EM is also used in the process. With locally produced EM, the compost is truly low-cost and can be sold to farmers at a low price, or can be used in municipal plant plots across town.

  Moreover, biogas collected from the compost pit is daily used in the municipal slaughterhouse as main source of fuel. This method reduces the municipality's fuel costs while generating supplementary income to the municipality.

  Energy efficiency is an issue that cannot be ignored. Instead of using firewood, cooking gas and chemical fertilizer, with hidden environmental cost such as transportation from the source, the use of locally produced biogas, grease fuel, compost and EM is a very good example of energy efficiency practice.

Picture 22. A compost production pit with ventilator and drainage ducts

- **Reduced Truck Trips to the Landfill Site**

  The solid waste management scheme mentioned before (the conveyor belt) is also a way of energy minimization.

  According to the objective of waste management, less waste means a reduction in the number of truck trips to landfill site and around town for trash collection. For example, before the use of the conveyor belt for municipal waste separation, it took three truck trips every day to the and fill site. But after the use of the belt, only one trip per day was necessary.

Picture 23. Municipal truck being loaded from the belt

1.1.4 City of Sustainable Consumption

- **Urban Agriculture**

  In the past, when communication and transportation systems were limited, each house, village or small town seemed to be entirely self-reliable. They ate what they planted or caught and later traded their excessive produce with the neighboring towns.

  These days, however, the self-sufficient lifestyle has been replaced by a money-earning and trading system, leading to an increased need for money and a decline in self-reliant communities.

  This also means that urbanization is increasing and green, agricultural areas are moving further and further away from town. Agricultural land is replaced by housing developments, roads and factories. Products we consume in daily life are produced elsewhere and transported to our town, including the rice we eat, the vegetable we cook, the fruit we enjoy.

Picture 24. Paddy field; being replaced by city expansion

The urban agriculture idea tries to introduce the idea of self-sufficiency back into society, with people producing food for their own consumption. As a town, we plant something to eat, not to sell to other towns. The rice is from the paddy field, the fish from the river, the vegetables are from the backyard and the fruit from the village next door. This cuts down on the need for transportation of goods and the environmental damage associated with that.

- **Backyard Organic Vegetables**

  On a small scale, municipal workers plant some common vegetable around the workplace, using only locally produced compost and EM as fertilizers. The vegetables are then harvested and sold to generate a supplementary income. This scheme has been well-received and the vegetables are regularly sold at local markets.

  Normally, organic vegetables are hard to find and are sold at higher prices than ordinary ones, but this does not happen in Muangklang. The residents can always find organic vegetable grown locally at an affordable price, making them popular.

Picture 25. Vegetable planted by municipal workers

- **City of Rice**

  Despite many commercial entrepreneurs, business companies, and shops, Muangklang seems to have its root on the rice field.

  In Thailand, it has been common that locations take their names after natural, topographical or human use characteristics. Many place names in Muangklang are closely related to the rice farmer's way of life. Due to its topography, Muangklang is the land for rice farming indeed.

  The mayor came up with the idea that Muangklang should be able to produce more rice and enough rice to feed its population. This idea is being promoted through activities and it fits with the environmentally friendly concept to consume local products.

Moreover, the mayor states that Muangklang aims to be self-sufficient: "Why do we have to buy rice if we can sufficiently produce some ourselves."

Picture 26. Muangklang used to grow rice extensively

- **Rabbits, Goats, Pigs and their Manure**

People can learn to grow their own food to achieve food security. Backyard farming is the way to achieve that. In Muangklang municipality operation grounds, a demonstration farm has been established.

With left over or thrown out fresh vegetables from the municipal market, some animals e.g. rabbits, goats, cows and pigs are raised and fed. In addition, pigs, being fed with the same vegetables and green stuff, are raised in a shallow earthen pit where the bottom is paved with rice straws. Cows are also raised in a field and feed on grass, a diet supplemented by leaf trimmings from the municipal landscape service.

Talking about their manure, rabbits and goats drop dry, nutritious granules and cows drop massive manure daily. These can be used as organic fertilizer in plant plots. Besides, the mixture of pigs' drop and straw, daily turned over by pigs' behavior, decomposes, while daily conditioning with EM makes it a perfect fertilizer for fruit farmers. The pit pig fertilizer can never meet the demand at present; it is widely used in fruit plantation.

- **EM and Compost**

The local production of EM and compost is one of the proofs that self-reliance is possible.

Instead of buying fertilizers or chemicals needed for cleaning or planting from outside suppliers, the residents have an alternative source for locally produced, less expensive fertilizer. This supports the urban

agriculture program as well. Actually, it would not be possible without the locally produced fertilizers.

- **Slaughterhouse Waste**
  Each night, operation at the slaughterhouse leaves behind fresh waste. Instead of carrying these bags of several kilos of waste to the municipal landfill on the day after, all this fresh organic waste is simply buried in a proper way around the slaughterhouse, in hope that it decomposes and becomes nutrient source for the soil later. By these means, a lot of waste is dealt with on-site.

- **Black gold**
  Black gold is not gold; it is not black either. It is worms' excretion. An exotic type of earthworm is kept in several buckets while it decomposes cows' manure mixed with leaves and straw. New manure, leaves and straw are added every three months for the earthworm to feed on.

  To moisten the mixture (habitat of the earthworms), some water is added on top of the mixture every day. Through adding the water the product, which is not the worm but its excretion, is collected: the dripping from the buckets' bottom outlet is collected, then bottled and labeled, and sold as earthworm liquid fertilizer. This is quite popular with ornamental plant lovers.

  However, there are more aspects to look to Muangklang's best practice. In addition to implementing the four policies aiming to turn it into a iveable city, Muangklang municipality is working toward the happiness of its residents. Therefore, in Muangklang, not only physical development, but also mental and spiritual developments are taking place.

Picture 27. Stacks holding earthworms to collect "black gold"

1.2 Quality of Life Promotion

Muangklang is where the river conservation activities and people's way of life can find their crossroad.

For better understanding, in Thailand, “Tham Boon” or “making merit” is a very common activity. To celebrate an occasion for either an individual family or a community together, “Tham Boon” ceremonies can be held at home or in a temple.

“Tham Boon” at home can be a daily activity when residents stand in front of their houses with freshly cooked or preserved foods and wait for monks to pass by. The monks pass through villages to receive the offering from local communities and return to their temple.

“Tham Boon” at temples are occasional celebration or rituals that take place here for either a single family or the whole local community. The temples serve for civil assembly. Community members join in and help fulfill the religious and social role of this ritual.

In general, the ceremony at the temple consists of a religious part, such as offering food to the monks, paying homage to the Buddha image, and a social part, such as donating money for the public benefit, etc. There is also a fun part, i.e. cultural and traditional activities such as music, dance show, games, procession and stage performances.

- **“Tham Boon” in the river**

  A few years ago, Muangklang municipality had just finished renovating an important boat pier when an idea about having a ceremony to celebrate the new pier and the town came up. The purpose was not just to celebrate, but also to emphasise the importance of the river. After the ceremony, everybody should be aware of the importance of Prasae River conservation efforts.

  Muangklang municipality combined the ceremony and the conservation of the river wisely by organizing all those mentioned above activities in the river.

  During the day, the highlight is the graceful procession led by Buddha images and revered monks on boats. After that there are games and fun competitions in the river such as kid’s kayak races and other boat races. In the evening, there are stage performances. All shows and dances are performed in the middle of the river. A floating stage is set on a sizable barge for the people to watch performances from the banks. People from Muangklang and other towns come and join the celebration in the river and feel the life of it.

  Not only the municipality who prepares the shows but also other communities participate in various kinds of activities and shows. After all, they realize the importance and their ownership of the river. The more important point is that without a clean river, there is no ceremony like this. On top of that, it is obvious that if the river is not well maintained, or the water quality is not good enough, the ceremony is not possible.

Picture 28. Annual river procession in the city of Muangklang
Municipal sports complex and recreational area

- **Municipal Sports Complex and Recreational Area**

A piece of land, 21 hectare big, located a few kilometers from the downtown area, has been developed into a sports complex for the general public.

Instead of investing in construction work, a big amount of the budget was spent, with unanimous consent of the municipal council, to buy a piece of land in the outskirts of the city and to develop it into a sports compound. Knowing that this project was for the good of the community of Muangklang, a couple who owned a piece of land adjacent to it donated it to the municipality to merge with the first piece.

There is a soccer field, basketball courts, petongue courts, safety playground, exercise facility - and all these facilities amongst green perennial trees. This is considered a new recreational venue for everyone to come and enjoy.

There is a free NGV bus service and boat service for everyone from the center of town to the sport complex.

- **Cultural Conservation and Promotion**

To ensure a good future, Muangklang emphasizes that the people in the municipality need to be aware of their roots.

A link to the past is established in several ways. For example, the renovation of boat pier and its importance is stated, there are talks and publications telling old stories of Muangklang, local history is integrated into the school curriculum, etc.

Recently, the old police station of Muangklang in the center of town was renovated and converted into a historical hall with a very classic, conservative look and local architectural features.

Moreover, the annual festivity in the middle of the Prasae River encourages people to join in and then realize the importance of the river and to participate more in the river conservation.

Picture 29. Auspicious ceremony in the annual festivity

2. Reasons for Program Development, Shortcomings and Challenges Addressed by Best Practice Model

2.1 Poor Water Quality in Prasae River

Muangklang is a town in Rayong province, Eastern Thailand. Originally, the town was located upriver from its present location. For centuries, it has expanded down along the Prasae (a.k.a. Krasae) river, moving closer to the mouth of the river to have a better connection to the sea. It has also grown continuously. The town moved to the present location 100 years ago. Nowadays, the downtown area is on both sides of the river a few kilometers from the sea.

The growth of the town brought not only a larger community, but also its waste. For years, all community waste had ended up in the river, slowly causing it to become polluted. Moreover, it became shallower as well. A shallower river means less water circulation. And less water circulation means worsening water quality.

In addition, with land transport becoming dominant, the rivers social significance seems to be reduced corresponding to its widths. People turned their back to the river, and welcomed the outside world coming in via the national highway, leaving the river blackened and dirty. All river-related ways of life seemed to diminish gradually.

The river passing through the town used to provide food for local people. They caught fish, crab and prawn from the river but lately this way of life changed due to the degradation of water quality. The aquatic animals seemed to disappear.

2.2 Solid Waste Constraint

Over 20 tons of solid waste are generated daily in Muangklang town. All this waste used to end up at the municipal landfill site. The handling cost is 1 Baht per kilogram of waste. This means that Muangklang municipality spent 20,000 Baht every day on waste disposal.

Moreover, the landfill site covers only 12.8 hectares and the lifespan is estimated 3-5 years only. It is clear, therefore, that the more waste there is, the shorter the time that the landfill site will be able to receive it. After that, a large amount of money needs to be invested to develop a new landfill site – and there is the strong risk that by that time there will be strong objections by the local community against such a development.

Not only Muangklang municipality is using this landfill site, but there are also more local authorities and private companies whose waste is deposited there. The list of users is as follows:

1. Na Yai Arm Municipality
2. Na Yai Arm Tumbon Administration Organization
3. Ban Na Municipality
4. Thung Kwai Kin Municipality
5. Pak Nam Prasae Municipality
6. Thung Kwai Kin Tumbon Administration Organization
7. Nam Pen Tumbon Administration Organization
8. Klong Poon Tumbon Administration Organization
9. Grohe's manufacturing plant
10. Para Eastern company
11. Mr.Prasert Reungboonsong's manufacturing plant
12. Ms.Atchara Paesukcheun's manufacturing plant
13. F&C company limited
14. Apina Industry company limited
15. Teo Ching Lee store
16. Suchin store
17. Grand Rubber company limited
18. Mr. Pongpot Wongsim
19. T.K. Furtech company limited
20. Greenwood company limited

3. Results Achieved and Relevance to Public Life

Muangklang municipality has implemented a number of initiatives to solve urban problems in a comprehensive and holistic way; output from one initiative can be the input for another one, or one activity in one initiative can support another initiative. Thus, talking about the results achieved, the results have to be considered in a holistic way, to notice the relationships between them.
The results of the Muangklang municipality model can be summed up under the aforementioned four guiding strategies:

3.1 City of Trees

- **More Trees and Green Areas**

  Having visited Muangklang, one cannot deny that it looks clean and green. From the entrance of town, the intersection on Highway number 3, to the far end of the municipal area, Muangklang is filled with plants and trees.

  Between 2001 and 2007, Muangklang municipality planted 14,179 trees. These trees can absorb 550 tons of carbon dioxide per year.

  Moreover, driven by an intense promotion campaign to make Muangklang a green city, not only is the municipality doing its job, private companies, schools, civil societies are doing the same: planting trees.

  As a consequence, Muangklang municipality has more green space per head than other towns and cities in Thailand, that is 15.77 m2 per capita (as of June 2010).

3.2 City of Waste Minimization

- **Waste Reduced**

  It is fairly difficult to see the result of waste minimization, because a lot of waste is missing!

  According to data collected, the amount of waste seems to have been reduced over the years. The table below shows a positive trend over the past seven years.

Fiscal year (October to September each year)	Total collected waste by trucks of 12 months (kg)
2004	7,714,832
2005	7,659,018
2006	7,462,795
2007	7,538,552
2008	7,147,650
2009	6,058,140
2010(Oct'09-Jun'10)	4,860,469

Table 1. Municipal waste collected by municipal trucks in each fiscal year

In 2004, there were 7,714,832 kg of waste (total of one year) collected by the municipal trucks in the municipal area. The effort on waste management has shown a positive result, since the amount of waste collected by the trucks has been reduced.

In 2009, there were only 6,058,140 kilograms of waste. This shows the improvement of on-site waste management, which strikes at the right point i.e. it reduces the waste at the source.

The effort on waste management will eventually expand the service life of the sanitary landfill of the municipality because less waste is filling up the pit each day. This ensures the longer service life of the landfill.

- **Waste Re-used and Recycled**

Incoming trucks loaded with municipal waste are very welcome in the municipal waste separation center. The conveyor belt in an open-air shelter is waiting with a team to separate all the unloaded garbage into organic waste and recyclable waste. The rest goes into the landfill.

According to the data collected (March and April 2009), it could be assumed that the daily municipal waste consists of 83% organic waste. All the separated organic waste is completely used in the making of compost instead of being disposed in the landfill.

The table below shows what comes out of the separating belt each month of the first 2 quarters of 2010.

Month-Year	Organic	Recyclable	Plastic
	(kg)	(kg)	(kg)
Jan 2010	13,185	5,282.9	1,714.5
Feb 2010	12,497	2,418.6	1,185.0
Mar 2010	13,053	2,639.0	1,184.0
Apr 2010	8,899	1,964.1	655.0
May 2010	8,569	3,034.4	2,342.0
Jun 2010	7,695	2,718.8	2,358.0
Total	63,898	18,057.8	9,738.5

Table 2. Amount of organic, recyclable, and plastic waste separated from the belt each month (to be further used and for sale)

- **Market Waste Makes Money**

The municipal market provides food to feed everyone in town. The increasing population definitely leads to increases of food and waste in the market. It is quite difficult to control this natural growth but there is a way to make things work out; convert the waste to money!

Every day, municipal collectors gather thrown out fresh market waste, i.e. parts of fresh vegetables, damaged fruits and leftover food. This organic mass is transported to the municipal compound and made into compost, EM or fed to animals.

Instead of dumping market waste, this amount of daily organic waste is making money. The table shows the data for the first two quarters of 2010.

Month-Year	Fruit & vegetable (kg)	Food waste (kg)
Jan 2010	14,874	8,509
Feb 2010	13,591	8,018
Mar 2010	15,219	8,968
Apr 2010	14,839	8,612
May 2010	15,331	8,967
Jun 2010	14,909	8,633
Total	88,763	51,707

Table 3. Municipal market waste; fresh fruit, vegetable, and food waste (becomes value-added instead of being disposed)

- **School Recycling Program Works out**

Not only the municipality but also school children are becoming involved in the solid waste management program. This learning process is taking effect. The more waste separation they can do the more recycled waste they can sell, leading to an increased income.

A very clear output measurement is the amount of recyclable waste and the corresponding income. Data collection can encourage the students to do more and more waste management. This idea finally reaches their homes and waste minimization and separation is starting to happen there as well.

So far, a number of schools have participated in the program, which are:

1. Klang Wittayasathavorn school
2. Wat Saranart Thammaram school
3. Wat Pho Thong school
4. Wat Plong Chang Peuk school
5. Rung Napa Pittaya school

The participating students from the schools taking part in this scheme have been working on solid waste management to pick out recyclable waste in school and have sold the collected waste. In addition to this sale, the municipality also pays the students 1 baht per 1 kg of recyclable waste sold in order to encourage the participants of the program.

For the past few years, the accumulative amount of recyclable waste is fluctuating depending on students' academic schedule, yet it has been good enough, taking into account that it is the effort of students.

Thus, nearly 30 tons of waste have been recycled in just seven months, instead of being wasted in the landfill pit.

Participating schools	Recyclable waste collected (Dec 07 - June 2010) (kg)
Klang Wittayasathavorn school	6,096.80
Wat Saranart Thammaram school	7,957.79
Wat Pho Thong school	4,333.30
Wat Plong Chang Peuk school	6,571.00
Rung Napa Pittaya school	3,677.10
Total	28,635.99

Table 4. Amount of recyclable waste collected from December 2007 to June 2010

- **Water Quality Improved**

In Prasae River, the water quality has now improved. This has been made possible through the cooperation between different activities. For example:

- Grease traps prevent organic load from entering the river;
- Liquid EM treats sewage before it reaches the river;
- Dredging improves water circulation in the river;
- Monitoring raises awareness of the young;
- The festivity makes everyone realize the importance of the river;
- Promotion of more boat trips in the river makes residents realize the importance of the river as transportation route;
- Promotion of eco-tourism in the river makes visitors and residents realize the importance of the river as tourist attraction.

The very simple evidence of an improvement in water quality is the sighting of fish in the river. In the past, aquatic animals were abundant. Then the animal population was reduced by the poor quality of water. Now it has come back. People living along the river said they witness more fish in the river.

Those who live near the river and some who catch fish and prawns from the river confirm that the water looks better and that they can catch more animals these days.

In addition, the reports from the trained students monitoring the water quality, confirm that the river has indeed become cleaner and that fish have returned.

Below is the number of 'monitoring agents' contributing to the improvement process.

- **Students Become River Inspectors**

Through regular training courses, teaching both the theory and the practice of water monitoring, the network of river monitoring stations gets expanded. The number of participating students is shown in the table.

Year	No. of participating schools	No. of participating students
2008	13	131
2009	14	148
2010	18	180

Table 5. Number of participating schools and students in the river monitoring program from 2008 to 2010

- **Grease Traps are Working Well**

After the grease trap was introduced to reduce organic load, particularly grease and oil, flowing into the river, the amount of grease that was collected has been increasing over time. Amount of grease and oil recently collected from grease traps are shown in the table below.

Month-Year	Grease collected (kg)
Oct 2009	978
Nov 2009	774
Dec 2009	746
Jan 2010	463
Feb 2010	886
Mar 2010	1,888
Apr 2010	1,465
May 2010	1,269
Jun 2010	755

Table 6. Recent grease collected from grease traps in Muangklang

So far, there are 1,188 grease traps in Muangklang municipality (2006 up to July 2010), which are installed in houses, gas stations, restaurants and other likely sources of grease and oil.

According to new regulations of Muangklang municipality, a new house must install a new grease trap and confirm that this has been done by bringing a photograph along at the time of registration. The recent number of traps installed in new houses is shown below.

Fiscal year	No. of new registered house which installs grease traps
2006	296
2007	118
2008	106
2009	211
2010	71

Table 7. Number of new house with grease traps installed

- **Waterway Resurrection**

Muangklang municipality initiated an improvement to the water transport system by renovating boat piers and related facilities such as the river embankment, and by promoting boat tours to see tourist attractions along Prasae River. The boat tour not only generates income for the boat owners but also increases people's awareness of water quality conservation.

There are now 14 boats (7-seaters) and 6 barges (50 passengers) providing service for visitors. The number of visitors fluctuates with the weather, but on average there are roughly 500 visitors per month.

Moreover, a free boat ride from the downtown pier to the municipal's new recreational and sports complex is becoming increasingly popular.

- **Annual Festivity**

Muangklang municipality combines the common Thai ceremony as a way of life and the conservation of the river wisely by organizing it in the river. This measure has had a great impact on local residents' mind because the Buddha ceremony is spiritually meaningful to the Thai people. The unique and creative way of celebrating, as well as the entertaining program, make people happy and they cannot wait for next year's ceremony. But while waiting for that, why not help conserving the river?

As a result, people realize the importance of the river and also their ownership of it. At least, the common perception is that without the clean river, spectacular ceremonies like these are impossible. River conservation and people's way of life thus coincide.

3.3 City of Energy Efficiency

- **Reduction of Greenhouse Gas Emissions**

As of 2004, Muangklang municipality, due to the collaboration with the Thailand Environment Institute (TEI) and with Local Governments for Sustainability (ICLEI), has made a commitment to reduce greenhouse gas emissions. Its data collection shows that the municipality and communities' activities emitted 87,194 tons of carbon dioxide in 2000 and would be more in the following years.

The municipality aimed to reduce the emission of this greenhouse gas by 20% from municipal activities and 3% from the community's activities. That accounted for several tons of carbon dioxide to reduce by these means:

- Energy conservation in the office (22 tons/year)
  - Change to high efficiency air conditioners;
  - Installing light reflectors and using high efficiency lightbulbs, including high efficiency ballasts;
  - Renovation of a small meeting room to use for meetings with 12 or less people.

- Municipal vehicle fuel cut down (16 tons/years)
  - Check up of all vehicles' engines;
  - Plan for efficient use.

- Efficient electricity consumption for public lighting (65 tons/years)
  - Change to high efficiency lightbulbs in sporting grounds;
  - Remove unnecessary lighting points;
  - Installing solar cells as energy source for warning lights at junctions.

- Efficient water work system (136 tons/years)
  - Construction of high water tower to increase pressure and reduce pumping.

- Waste minimization
  - Waste management schemes in municipal offices (4 tons/years), schools and communities (572 tons/years);
  - Waste separation at municipal ground;
  - Use organic waste to produce EM.

- Green area
  - Planting in urban area and planting mangrove (550 tons/years);
  - Find a space for new sporting grounds and park.

- **Energy Conservation and ISO 14001**
  Aiming to develop a better working attitude of the municipal officers and to improve the efficiency of Muangklang municipality's service, the introduction of a standard for energy and environmental management took place in 2001.

  This includes electricity saving measures in the office as mentioned, and fuel savings by municipal vehicles. Reducing truck trips to the landfill site from three trips to one trip per day is one of the best examples. One side effect has been an improvement in the service quality of the municipality.

  It can be assumed that the introduction of this performance standard not only takes effect individually but also publicly. The ISO 14001 is certified by the Thailand Institute of Scientific and Technological Research.

- **New Public Water System**
  A new water tower was constructed to increase water pressure while at the same time reducing the electricity costs for pumping. After a year, it was found that the electricity consumption (unit per cubic meter of water produced) was reduced accordingly.

  The electricity consumed per cubic meter of water produced was between 0.35 – 0.45 in 2003 and after the construction of the new water tower, it became less than 0.30 on average per month in 2004.

- **Traffic Control and NGV Bus**
  Muangklang municipality has taken actions to control the urban traffic by reinforcing traffic rules and regulations, adding new regulation and redesigning some routes. This is designed to make traffic flow better, particularly during the rush hour. The improved traffic flow reduces fuel waste, air pollution and residents' stress.

  In addition, instead of using private cars in and around the town, compressed natural gas (Natural Gas Vehicle: NGV) public buses are offering a free-of-charge service to Muangklang residents during rush hours. This initiative helps reduce traffic problems, air pollution, total fossil fuel consumption and greenhouse gases produced daily, claiming 33 kilogram of carbon/vehicle/day, and finally improves the quality of life of the people.

- **Biogas and Alternative Fuel Production**
  Methane from the compost production provides enough biogas to serve the needs of the municipal slaughterhouse that operates daily, completely replacing conventional fuel (firewood). In addition, grease and oil collected from a number of restaurants in town by grease traps can is regularly used as additional fuel source.

3.4 City of Sustainable Consumption

- **Urban Agriculture and City of Rice**
  Normally, organic vegetables are hard to find and expensive, but not in Muangklang. Thanks to EM and compost, there are locally produced organic vegetables available at the market. The residents can always find organic vegetables grown locally at a competitive price.

  Moreover, the mayor came up with the idea that Muangklang should be able to produce more rice and should be able to produce enough rice to feed its population, so rice farming is being promoted. Rice farmers feel more secure and confident of a long-term commitment, so they keep growing rice.

- **Locally Produced Fertilizers**
  Availability of locally produced fertilizing agents such as EM, compost, green manure, animal manure and black gold ensures that local agriculture can be successful.

4. Description of Muangklang City

Muangklang municipality is 14.5 km2 large, consisting of 13 communities. As of December 2008, the population was 17,197 and there were 3,309 households. It is 269 km from Bangkok by the eastern highway.

Muangklang is located near the sea. It is a plain with hilly areas on the east-west direction with Prasae River flowing through the heart of the town into the Gulf of Thailand. On the east side of the river is an agriculture area and the west side is hilly and filled with communities, commercial area, governmental units, factories, etc.

Muangklang's climate is tropical with sea breezes all-year round. It is mainly warm, but cooler near the sea. The rainy season starts in May and lasts through October. On average, it rains 128.8 days per year and average rainfall is 1,638.12 mm per year (1995-1999). The average temperature is 28.91 degree Celsius (max 38.16, min 15.96).

5. Budget for Best Practice Implementation

"It is not the money that matters, but how you use it."

If one looks closely at the activities in Muangklang municipality, there was not a huge investment in the best practice model. For example, people think about large incinerator, a large building or an enormous landfill pit to handle the growing city's waste. Instead, in the middle of Muangklang town, a simple

conveyor belt with comprehensive management and value-adding process takes on that. Income generating activities also contribute to make the project sustainable.

Most of the best practice schemes spend their annual budget in a wise way. If the budget available is not enough, private companies in the vicinity sometimes contribute either financially or with materials; for example, Apina Industry Company, National Starch and Chemical Company. Rayong province also supports the conservation programs, for example, by providing grease traps for Muangklang municipality to install in houses.

These companies also helps by supporting the printing of the gazette, with the monitoring program, the annual festivity, etc.

What cannot be missed when talking about cost is the “time” one has to spend on finding ways to solve the problem and on carrying out the work. The mayor has spent a lot of his working and personal time thinking and working hard all these years.

6. Specific Technical Expertise

Most work explained above depends on existing knowledge, local wisdom, and people’s participation and is brought into practice by the initiation of the mayor. Yet, it has been possible by trial-and-error learning process, with a strong will to make it better.

Section B. Methodology in Design and Implementation of Best Practice

1. Brief Description of Best Practices Design Process: Initiator, Main Actor and Driving Forces

The present mayor of Muangklang municipality, Mr. Somchai Chariyacharoen, initially aimed to bring the river back to life and conserve the identity of the town which had been closely related to Prasae River, by first saving this river from pollution. This conservation effort was where the whole story began.

Mr. Somchai looked into various methods to clean up the river. As a next step, some more measures were initiated with the goal of river rehabilitation. The result is very satisfying: Muangklang now has a clean river, due to a number of interventions. Today, the mayor's efforts extend to cover water, air, soil, waste, and standard of living problems. His ultimate goal is that Muangklang should be a liveable and pleasant town with enhanced quality of life.

Picture 30. The mayor spoke with visitors in the black gold stacks storage

The present mayor, Mr. Somchai Chariyacharoen, aiming to turn his town into a truly sustainable and liveable city, initiated one program after another to tackle urban environmental problems comprehensively, to use existing resources and potential, to short-cut bureaucratic friction, to emphasize simplicity but effectiveness, and ultimately to change from a consumerism way of life to a more productive and self-sufficient one for long-term sustainability.

2. Functions and Roles of National Government

The 'Klang Model' has become known as an admirable development scheme. The mayor's work has been propagated through various kinds of media nationwide. Now Muangklang municipality is the ultimate learning center of the Eastern region with a large number of visitors who wish to learn from it.

Muangklang municipality has received a few awards, for example the prize of "Liveable City 2004" from the Ministry of Natural Resources and Environment. In 2010, its project on biogas also won a prize from the Department of Alternative Energy Development and Efficiency, Ministry of Energy, due to its efficient use of biogas tanks.

3. Brief Description of the Implementation Process, Legal and Administrative Conditions, Qualifications Process, Monitoring and Evaluation

It is usually the mayor who comes up with new ideas to solve a problem, which are then being implemented first on a small scale. He has fairly practical mind, so most of the projects are successful. He has a number of team members who closely support him. The lesson learned and his successes make it easier for him to gain trust and support from his municipal staff, the council, civil groups, private companies and the general public.

In addition, he tries to assess and improve his work as time goes by, in order to increase the efficiency of his particular work. This ensures that all his work is never wasted but gets improved after some time.

4. Civil Society and Community Involvement

- *Reflection*

  All good practices have good outcomes. Over time, Muangklang residents can see cleaner water in the river, improved means of public transport, locally produced organic vegetable, fertilizer, and compost, more and more green areas, visitors coming to learn from the municipal learning center, etc.

- *Public Participation*

  These initiations have proved to be well-received by communities. People can see the common benefit and are happy to help. For example, market vendors collaborate in collecting discarded vegetables, schools join in the waste management program and house owners install grease trap in their house.

- *Popularity*

  The success of the program helped the mayor gain popularity with the people of Muangklang. Three consecutive election wins showed that people want him to continue his good work. This gives him more chance to create more projects and sharpen the existing ones to a higher efficiency.

5. Role of the Media

The media did not play a big initial role in the success of the project. After his inauguration in 2001, the mayor worked hard and his efforts took effects. After receiving some awards, he became better known, particularly for his unique way of leading Muangklang towards being a sustainable city.

- Mr. Somchai Chariyacharoen has been interviewed and his initiatives and ideas have been propagated through international, national and local newspapers, radio and television channels.

- "Klang Model" (a.k.a. Klaeng Model) was the name of his unique development scheme called by the media.

6. Input from International, National and Local Experts

Many organizations have helped Muangklang municipality to improve its low carbon city campaign. Among them, the Thailand Environment Institute (TEI) has continuously collaborated and assisted in different aspects. For example, the introduction of a greenhouse gas reduction program called Cities for Climate Change Program in 2003, visitors from foreign countries at different occasions, etc.

Since the mayor has been proactive and creative, the relation between the municipality and the outside institutions or experts is positive and collaborating.

7. Types of Implementation Activities

7.1 City of Trees

- ✓ Promotion of planting trees around town;
- ✓ Turning trash into trees;
- ✓ Increasing the green area;
- ✓ Motivating people to plant trees.

7.2 City of Waste Minimization

- Solid waste management
  - ✓ Set up a municipal waste separation center;
  - ✓ Collecting market's organic waste;
  - ✓ Animal farm in town;
  - ✓ Promote 3 R; Reduce, Reuse, Recycle;
  - ✓ Landfill management;
  - ✓ School recycling program;
  - ✓ Reducing bins.

- Water quality management
  - ✓ River conservation;
  - ✓ Grease trap;

- ✓ EM;
- ✓ Stakeholder collaboration;
- ✓ PR;
- ✓ River monitoring program;
- ✓ Dredging;
- ✓ Waterway resurrection.

7.3 City of Energy Efficiency

- ✓ Office building improvement;
- ✓ Energy saving campaign;
- ✓ Fuel saving campaign;
- ✓ Renovation of public water system;
- ✓ ISO 14001;
- ✓ Traffic control and re-design;
- ✓ NGV bus;
- ✓ Non-motorized route;
- ✓ Reduced truck trips to the landfill;
- ✓ Bio-gas and alternative fuel production;
- ✓ Compost, EM and biogas.

7.4 City of sustainable consumption

- ✓ Urban agriculture;
- ✓ Backyard organic vegetables;
- ✓ City of rice;
- ✓ Rabbits, goats, pigs and their manure;
- ✓ EM and Compost;
- ✓ Slaughterhouse waste;
- ✓ Black gold.

- Quality of life promotion
  - ✓ Making merit in the river;
  - ✓ Municipal sports complex and recreational area;
  - ✓ Cultural conservation & promotion.

8. Quality Control and Coordination Mechanism

ISO 14001 has been a tool to improve the overall working process and the service of Muangklang municipality since 2001. The tool can be considered a big change for office workers. They have learned to sit and work together, collect data and analyze problems, plan and implement, and evaluate the change before improving it again with continuous monitoring.

This ensures the quality of work and finally the quality of life of Muangklang people.

Section C. Evaluation of The Best Practice Model

1. Sustainability of the Model

Sustainability is ensured by the following features:

- *Self-reliance*
  The conveyer belt waste management staff, for example, make up a team under close supervision of the mayor. He designated this unit as a learning center. By selling its products such as compost, EM, recyclable material, locally grown organic vegetable, etc., this center is producing enough money to pay its operation cost and some incentive for the workers. Local authorities from around Thailand visit this learning center, paying an entry fee. This self-reliance is very important to be successful in the long run.

- *Win-Win Situation*
  In particular, the staff who are performing the waste separation on the conveyor belt, are doing a very good job. The municipal landfill is taking in less waste and providing longer service to Muangklang people, the municipality can save the cost of additional truck trips to the landfill, the belt team who does the job gets some incentive from selling the recyclable on top of their wages. Everyone is happy.

- *Education of the Young Generation*
  The recyclable waste program is expanded to some local schools. Students are learning solid waste management not only by being taught about it, but by doing it. They see the results of decreased waste and the increased income they generate. Volunteer trainers from the municipality go around schools to educate, demonstrate, and encourage students to participate. And the lessons are added to school's curriculum in the hope that students will carry on integrating conservation into their lives.

- *Public Relations*
  The mayor has been involved in various types of public relations activities, for example, a local FM radio program, a municipal website, announcements, events, and even face-to-face talks, to make sure people hear what has and what will be done.

  Furthermore, many initiatives attract publicity. People find out about them, understand them and are happy to help with the municipality's projects.

2. Major Success Factors of Muangklang's Best Practice

Mr. Somchai Chariyacharoen has proven that money is not the most important resource for successful development projects!

While most local governments complain about limited budgets and keep waiting for more funds, Muangklang's mayor spends his time thinking about what he can achieve with the resources he has.

Finally, his most powerful driving force is the participation from the people who see the benefit the community gains from his endless initiatives and efforts. One man cannot achieve this success without the participation of people around him. The mayor needs people who are keen and willing to be part of the effort.

He therefore uses various methods to publicize his ideas. After some years, his efforts have shown results. His staff know what he is doing and help as they can. Local private companies and local authorities also join in.

The most important element are the people of Muangklang without whom none of this would have been possible. They have seen what the mayor has done over the past years and now wish to help him in whatever way they can, because the mayor has made them realize what their future can be. They are confident that they are following the right leader in the right direction.

3. Major Challenges and Obstacles of Muangklang's Best Practice

The first challenge is how to even improve each activity that has been initiated. "How to do it better" is the biggest challenge. The mayor spends some time developing a project from an initiative, then revises its efficiency and finds a way to improve it

Secondly, the legislatory framework of governmental rules and regulations, in particular, regulations for the municipality to follow, is somehow difficult for a new initiative to fit around. However, there is always a way if thinking out of the box.

Thirdly, the trust of people is harder to gain than it seems. The mayor takes years before the people and even his staff see what he is trying to do, before they understand and collaborate.

4. Why This Model is Viewed as Best Practice

The development of Muangklang is unique. Along with the growth, it tries to find its own roots and puts effort into capacity building of different communities and building relationship among them. These communities are important driving forces that the development really needs.

The cutting edge of the development is the mayor, Mr. Somchai Chariyacharoen, together with his team. They are well trusted and have won the election for a 3rd time now. The success comes from this devoted leader who has faith and gets his hands on the new ideas he creates, many of which work successfully for the sake of people's quality of life.

Strong participation and collaboration then come from the staff, the civil society, the private sectors and everyone in town. Large amount of money or advanced technology is not the main recipe for success here in Muangklang but the heart of the town is.

5. Muangklang's Best Practice Transfer and Replication Adaptability

- *Waste reduction = Cost reduction = Income generation*
  It is a truly win-win situation for the municipality, the team and Muangklang's people. A small team of 42 workers is operating waste management schemes and they can save money for the municipality whilst making enough money to pay their salary plus incentive. The team makes a living. The municipality saves money and improves effectiveness. The people of Muangklang feel the charm of the green city they live in.

- *Motivation*
  It's better seen than heard. People can see improved situation, solved problems and better way of living. Any town residents would gladly adopt the proven measures once they have heard about Muangklang story.

- *Less Dependent on National Budget*
  Learning more tactics from Muangklang, any municipality would feel eager to start their own projects without waiting for new budget allocation. Most of the best practices here in Muangklang are not expensive at all.

Instead of …	Muangklang …
…a costly incinerator,	…uses the conveyor belt to deal with its waste.
…a wastewater treatment plant,	…tackles the problem by using EM and grease traps.
…road expansion or fly-over,	…introduces NGV public bus.
…investing annual budget in constructing more buildings,	…chooses to have more and more green areas.
…dumping waste,	…finds a way to use it.
…bringing in food,	…urges its people to produce it.
…consuming more,	…tries to be more productive

So, national budget allocation is not the limit. What it requires is time and effort to adapt the proven measures to suit one's setting.

- *Institutionalize*
  The mayor has passed the trial and error stage of the project and now put things together as proven methods. He tries to imbed these proven methods into institutions such as civil society and schools. He passes on his initiatives to other people not through lectures but demonstrations, in the hope that they, especially the young generation, will continue the best practices to make sure that Muangklang remains a liveable city forever.

Best Practice 12 | BP 12
Marikina Eco-Savers Project, Marikina, Philippines

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Marikina Eco-Savers Project, Marikina, Philippines

Section A. Description of Best Practice

1. An Introduction to the Best Practice Model and its Innovative Elements

The eco-savers program is Marikina city's innovative recycling scheme, which promotes a culture of discipline among young people through ecological solid waste management. The name of the program 'eco-saver' implies several meanings, including the following:

1. Saver of ecological system by being aware of sound environmental practices;
2. An ecological solid waste management practitioner from a household;
3. Economic savings realized through recycling of garbage.

Among the program's innovative elements are the following:

- *Waste Management at Source*
  The program requires students to bring recyclable garbage from their respective households to school during an assigned Eco Day — the day when the garbage is going to be weighed and credited to their issued eco-savers passbooks. Students and parents are partners of the city government in practicing waste segregation and recycling practices at the household level.

- *Empowerment of Elementary Pupils through Ecological Solid Waste Management*
  Even at an early age, the pupils at Marikina city's public schools were given an opportunity to have meaningful involvement and create an influence to fellow young in implementing sound ecological solid waste management practices by recovering recyclable materials from the household waste. This becomes a valuable experience that instills in them the values of discipline and concern for the environment.

- *Promotion of economic benefits from recyclables*
  Even garbage is still valuable. This program is not only rewarding for the environment but also for the students who get points for the recyclables they bring to school. The recyclable garbage is valued according to the prevailing market price, i.e. PhP1.00 = 1 point. Points earned entitle the students to shop in the eco-savers bus which carries educational materials such as dictionaries, books, school supplies and educational toys, as well as basic commodities such as sugar, choco powder drink and rice.

- *Incentive Scheme thru the Eco-savers passbooks*
  Each student is issued the eco-savers passbook at the beginning of the school year. The passbook is where the points of the student-owner are credited and recorded according to the recyclable waste material he or she brings to school. An eco-saver who wishes to shop in the eco-savers bus only needs to present this passbook which entitles them to exchange their points for any of the goods sold inside.

- *Utilization of Eco-savers Bus*
  The eco-savers bus or the mobile store is a converted city government facility which contains educational materials like dictionaries, story books, school supplies and educational toys, as well as basic commodities such as sugar, choco powder drink, coffee and rice. This range of goods is exchangeable for the points secured by the students from their recyclables.

2. Reasons for Program Development, Shortcomings and Challenges Addressed by Best Practice Model

The eco-savers program of Marikina city supports the Republic Act 9003 or the Ecological Solid Waste Management Act of 2000, which requires local government units to adopt a waste segregation scheme to pave the way for the environmentally sound realization of an initial waste diversion goal of 20% through the 'reuse, reduce, recycle' approach. Below is an excerpt of the law.

[REPUBLIC ACT NO. 9003]

AN ACT PROVIDING FOR AN ECOLOGICAL SOLID WASTE MANAGEMENT PROGRAM, CREATING THE NECESSARY INSTITUTIONAL MECHANISMS AND INCENTIVES, DECLARING CERTAIN ACTS PROHIBITED AND PROVIDING PENALTIES, APPROPRIATING FUNDS THEREFORE, AND FOR OTHER PURPOSES.

It is hereby declared the policy of the State to adopt a systematic, comprehensive and ecological solid waste management program which shall:

(a) Ensure the protection of public health and environment;

(b) Utilize environmentally sound methods that maximize the utilization of valuable resources and encourage resources conservation and recovery;

(c) Set guidelines and targets for solid waste avoidance and volume reduction through source reduction and waste minimization measures, including composing, recycling, re-use, recovery, green charcoal process, and others, before collection, treatment and disposal in appropriate and environmentally sound solid waste management facilities in accordance with ecologically sustainable development principles;

(d) Ensure the proper segregation, collection, transport, storage, treatment and disposal of solid waste through the formulation and adoption of the best environmental practices in ecological waste management excluding incineration;

(e) Promote national research and development programs for improved solid waste management and resource conservation techniques, more effective institutional arrangement and indigenous and improved methods of waste reduction, collection, separation and recovery;

(f) Encourage greater private sector participation in solid waste management;

(g) Retain primary enforcement and responsibility of solid waste management with local government units while establishing a cooperative effort among the national government, other local government units, non-government organizations, and the private sector;

(h) Encourage cooperation and self-regulation among waste generators through the application of market-based instruments;

(i) Institutionalize public participation in the development and implementation of national and local integrated, comprehensive and ecological waste management programs; and

(j) Strengthen the integration of ecological solid waste management and resource conservation and recovery topics into the academic curricula of formal and non-formal education in order to promote environmental awareness and action among the citizenry.

As one of its many challenges, Marikina city had to find ways to minimize solid waste in the city. The city was coming to grips with the challenge of complying with the waste diversion goal of 20%, taking into account the active participation of its citizens. The success with which the city dealt with this challenge was one the factors that has gained Marikina city a reputation for upholding environmental cleanliness and effective solid waste management. In fact, it was the first city in the national region to fully implement the waste segregation program at a citywide scale.

The programs on cleanliness and solid waste management are initiated by the Waste Management Office (WMO) of the city government created by virtue of ordinance No. 204 series of 1996. Such programs of the city government include administering an ecological solid waste management. The responsibilities of the office cover solid waste collection and disposal, street and sidewalk cleaning, implementation of laws and ordinances regarding physical cleanliness, and participation in other special programs and activities of the city government.

According to the WMO, the average volume of garbage collected in a day in Marikina city is 6004 cubic meters/day. This volume of garbage is collected from households, the market, shops, restaurants, streets, institutions and river clean-ups. Demonstrated below is the share of the corresponding waste sources to the volume of garbage collected in the city.

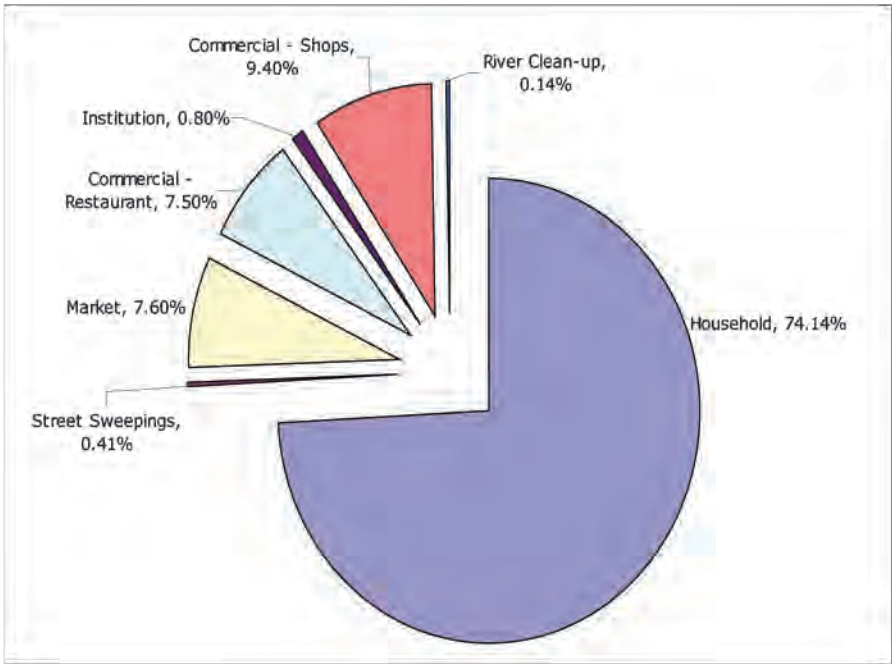

Figure 1. Marikina City Waste Source

Of the waste generated from households, 45% is biodegradable while the remaining 55% is non-biodegradable. According to Mr. Renan Mateo, Special Project Chief of Marikina City Environmental Management Office (CEMO), almost 80-90% of household non-biodegradable waste can still be reused and recycled. Shown below is the household waste composition as identified by WMO.

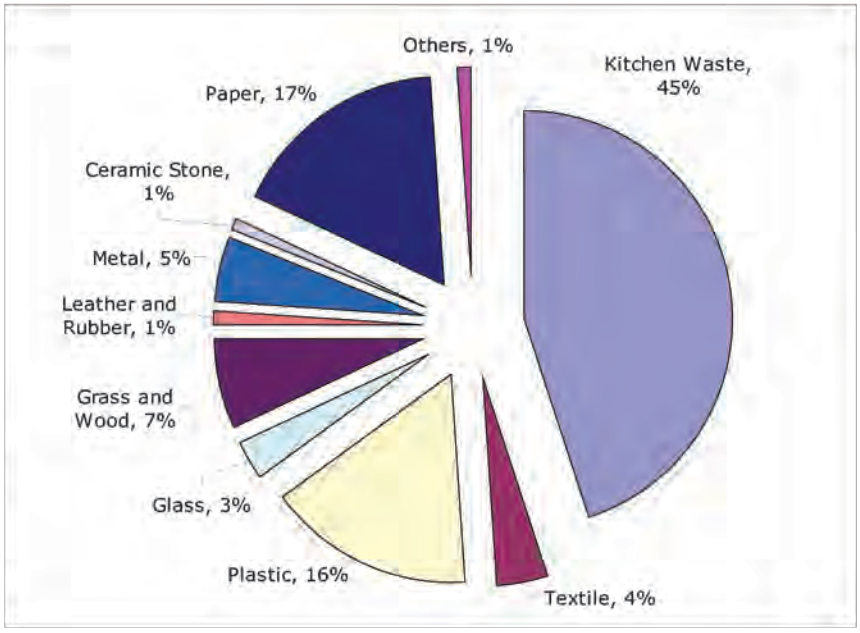

Figure 2. Household Waste Composition

Even with the garbage volume posted above, the WMO is still able to achieve a garbage collection efficiency rate of 99%, the highest rate achieved in Metro Manila. The operational cost of garbage collection is estimated at PhP87.00/ person/year, which is considered as one of the lowest in Metro Manila. [WMO, Marikina City]

According to Mr. Mateo, the office also considered how to prolong the life of the present landfill site of Metro Manila – the Rodriguez Landfill. All the 17 local government units (LGUs) of Metro Manila, including Marikina city, dump their garbage at the said sanitary landfill. To recover reusable and recyclable household solid waste and contribute to prolonging the landfill's lifespan, WMO of Marikina city came up with a program on solid waste management at source with innovative mechanisms in place – the eco-savers program.

The following are the problems addressed by the eco-savers program:

- Students need healthy and liveable communities;

  Second-hand shops need an opportunity to expand their business;

- City government needs to meet its waste reduction goal and entice people to practice ecological waste management.

In 2004, Marikina city started implementing the eco-savers program with the following objectives:

- To educate and achieve the target of 101,782 households in Marikina city to religiously practice waste segregation and recovery of recyclable household waste by enlisting public elementary students and teachers to be eco-savers;

- To gradually realize the waste diversion target of 20% through recycling;

- To eventually reduce the cost being incurred by the city in its solid waste management program;

- To instill the value of environmental concern, preservation of health, consciousness on the amount and type of waste the target households produce, and the importance of savings.

3. Results Achieved and Relevance to Public Life

The following are the significant results of the eco-savers program:

3.1 Instilling the Value of Savings and a Culture of Discipline

The eco-savers program has awakened and harnessed the value of savings and the culture of discipline among its constituents, capitalizing on waste management at source. The savings not only refer to money but also to saving the ecological system by recovering recyclable garbage.

- *Compliance to RA 9003*
  The city government's compliance to the national law on ecological solid waste management comply (R. A. 9003) is significantly attributed to the efficient reduction of waste brought about by the eco-savers program. The program operates a school-based solid waste management scheme where the waste is segregated at household level.

- *Recognition of Marikina City's Solid Waste Management Innovative Practices*
  The eco-savers program has gained Marikina city, a multi-awarded city, yet more recognition when the program was awarded the Galing Pook Award in 2007.

3.2 Generating Additional City Revenue

The monetary value of the recyclables under this program has reached a total of P1.3 Million. Although the amount may not be considerable enough to be income-generating for the city government, it is able to sustain the purchase of the commodities exchanged for the points earned by the students.

3.3 Savings on Disposal Cost

For the city government, the program has contributed to the decrease in the costs being incurred in the disposal of local solid waste. From a requirement of fifty (50) truckloads/trips a day to the dumpsite, the numbers were reduced to an average of thirty (30) trips a day. The recyclables could have ended up in the dumpsite had they not been recovered by the students.

3.4 Promotion of Proper Waste Management

The program has stirred the consciousness and curiosity of the community, thereby promoting waste segregation and recycling practices at household level and amongst young people. The program, its objectives, methodologies

and long-term benefits work to the advantage of every citizen of the city. Aside from the economic benefits reaped from the program's activities, the participants are greatly encouraged to perform responsible solid waste management.

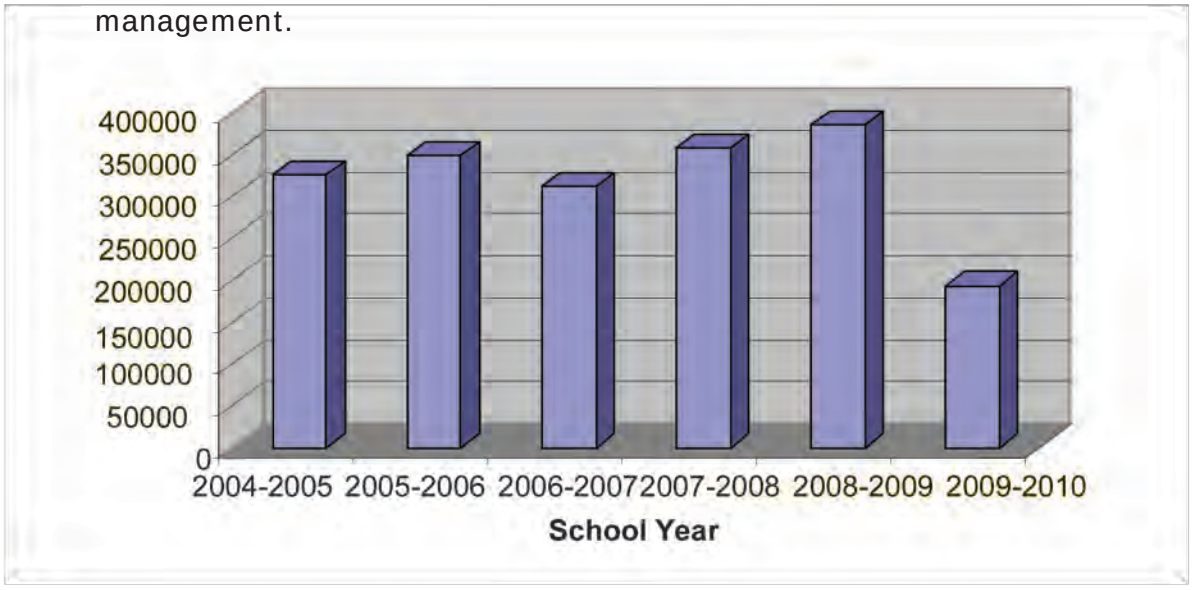

Figure 3. Total Collected Recyclable Solid Waste in Kilograms (Excluding Bottles)

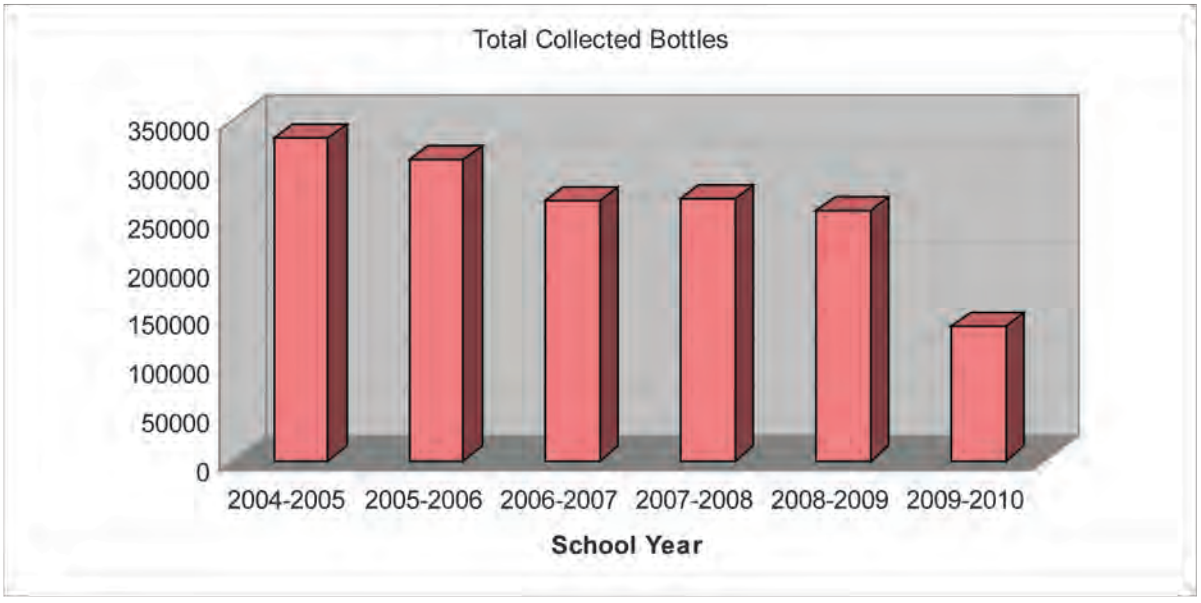

Figure 4. Total Collected Recyclable Bottles

3.5 Empowerment of the Constituents

The program has encouraged the involvement of parents, paving the way for regular interaction with teachers and city government personnel. Such regular interaction resulted in the generation of inputs and suggestions for relevant program strategies from the stakeholders. Eventually, some of the suggestions were considered and some were adopted, particularly those pertaining to the program's sustainability.

The public school teachers were made aware of the existing environmental conditions, particularly the state of solid waste management. The knowledge they gained has made them confident about the information they pass on to their students.

Adopting this ecologically sound practice at the household and community level is a form of people empowerment. The household members – both the parents and the students - are given free reign to decide how they can best contribute to solve the perennial problem posed by garbage.

Furthermore, the program has helped empower the students in terms of their consumer capacity because they are able to use the points they earn sensibly by purchasing from the range of commodities contained in the eco-bus. The purchasing power reflected in the points earned by each student within a school year ranges from P50.00 to P1,800.00, which helps to cope with the expenses of school supplies being shouldered by parents.

3.6 Contribution to the Preservation of the Environment

Educating the community and getting its members to practice ecological solid waste management is vital to the preservation of health and the environment. Through this program, a total of 238,000 kilograms of waste have been diverted from dumpsites, which could have contributed to air and land pollution. The decreased number of trips being made by the garbage trucks has contributed to traffic de-congestion, less air pollution and energy conservation.

3.7 Strengthened Faith in the Government

The program has made the constituents feel the presence of the city government, especially on the aspect of waste management, thereby strengthening their faith in their government. It manifests the strong political will of the city government in implementing bold and innovative programs aimed at attaining full compliance with the national law.

Moreover, the program's mechanics and activities also have become a benchmark for other LGUs to emulate during their "lakbay-aral" or study tours in the city.

3.8 Creation of Business Opportunities for Second-hand Shops

The program has provided second-hand shops within the city with regular sellers – the public elementary students, helping boost their income generation.

4. Description of Marikina City

Situated along the eastern border of Metro Manila, Marikina city is a valley surrounded by a stretch of mountain ranges and hills and endowed with rivers such as the Marikina River running across the middle and the Nangka River up north. It is one of the sixteen (16) cities in Metro Manila. It is bounded by Quezon city to the west, Antipolo city [of Rizal province] to the east, San Mateo [Rizal] to the north, and Pasig city and Cainta [Rizal] to the south.

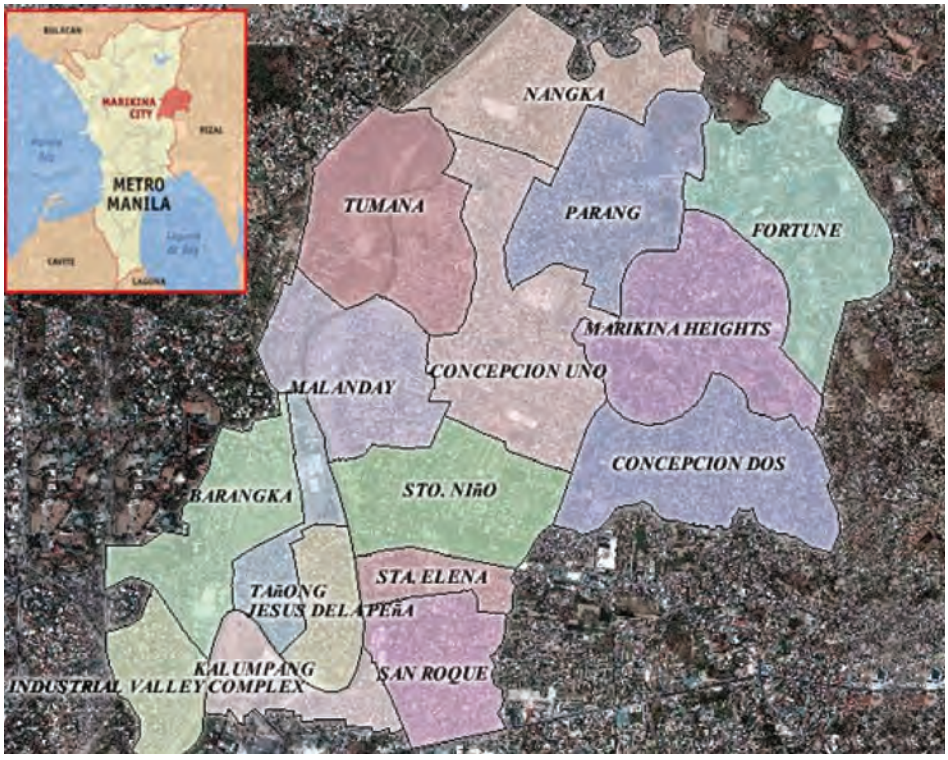

Illustration 1. Map of Marikina City and Component Barangays

Marikina city's total land area is approximately 2,150 hectares. This corresponds to occupying 3.42% of Metro Manila's total land area. There are 16 barangays comprising Marikina – namely, Sto. Niño, Tañong, Malanday, Kalumpang, Barangka, Industrial Valley Complex, San Roque, Sta. Elena, Jesus dela Peña, Parang, Concepcion Uno, Concepcion Dos, Nangka, Marikina Heights, Fortune and Tumana.

According to the National Statistics Office, there were 490,612 people and 104,164 households residing in Marikina city as of 2008. The average household size is 4.71. The employment rate is 87.5% (NCSO, 2007).

Marikina city is one of the wealthiest local government units (LGUs) in the Philippines in terms of current assets, cash in banks, share of internal revenue allotment (IRA), gross income and gross net income. It has evolved to become an ideal location for business, hosting operations of multinational companies – local and foreign - exporters, banks, real estate firms, information and communication technology companies, among others.

Regarded as the shoe capital of the Philippines, it boasts of winning multiple awards not only in terms of national but also international recognition. It was awarded the Most Competitive Metro City in the Philippines in 2004 by the Asian Institute of Management (AIM) and the Most Business-Friendly LGU citation in 2008. Further to that, it is considered to be one of the healthiest and liveable cities within the Asia-Pacific by the World Health Organization (WHO). Second to Las Pinas city, Marikina city has gained the seal of being a Hall Famer for bagging The Cleanest and Greenest City award bestowed by the Philippine government.

Year	Award / Recognition	Given By
1996	Cleanest and Greenest Town in the NCR	DILG
1997	Cleanest Inland Body of Water in the National Capital Region	DILG and MMDA
1999	First Runner-up, Search for the Cleanest and Greenest City in the NCR	Regional Search Clean And Green Selection Committee, DILG
2001	Model Local Government Unit in Environmental Protection and Management	Pollution Control Association of the Philippines
2005	Gawad Pangulo sa Kapaligiran Special Award to Marikina City for exemplary environment management	Office of the President
2008	Galing Pook Award for Eco-Savers Program	Galing Pook Foundation

Table 1. Marikina City's Awards/Recognitions on Cleanliness and Environmental Management

Marikina city is headed by a mayor and a vice mayor who are elected for three-year terms. The mayor is the chief executive and leads the city's departments in executing city ordinances, implementing programs and projects, and improving public services. The vice mayor heads the legislative council and signs all warrants drawn on the city treasury for all expenditures appropriate for the said council's operation.

Below is the organizational structure of the Marikina city government.

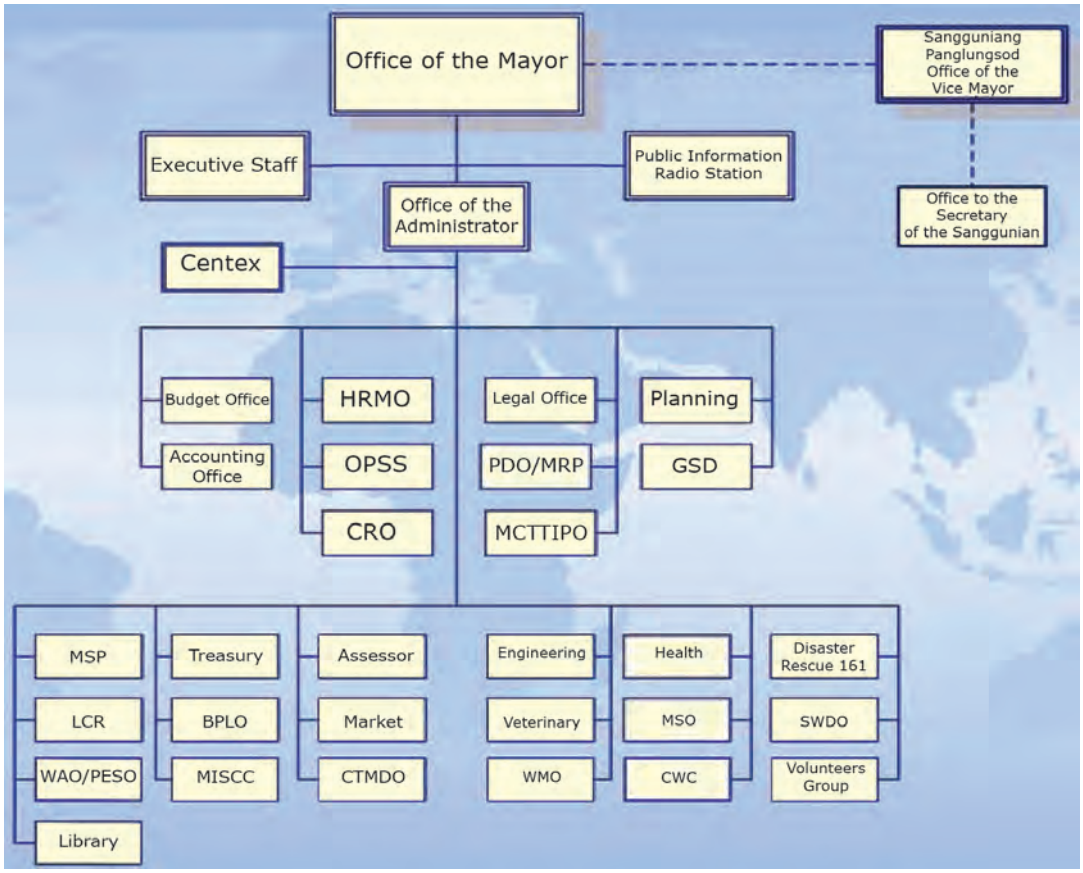

Illustration 2: Marikina City Government Structure

5. Budget for Best Practice Implementation

Initially, the program was able to source funds from the UNDP/Africa-Asia Eco Partnership, for the reproduction of the passbooks for the school year 2004-2005. In the later phase of the program, the city government shouldered the passbook reproduction cost.

School Year	Passbook Reproduction Cost
2004-2005	PhP248,000.00
2005-2006	PhP260,000.00
2006-2007	PhP129,900.00

Table 2. Passbook Reproduction Cost

The used eco-savers bus was an asset of the city government converted to a mobile store. The chairs were removed and the bus was installed with racks or shelves where the goods for purchase are displayed.

Initially, the bus only carried school references and materials. The parents of the students suggested to include basic commodities like rice and sugar in the exchangeable goods. Eventually, the WMO considered the suggestion since the parents are also considered 'customers' alongside the children/students. The amount generated from selling the recyclables was used by WMO to purchase the educational materials and basic commodities found in the eco-bus.

It has to be noted that there was no financial equity required from the participants, just recyclables from their households.

Section B. Methodology in Design and Implementation of Best Practice

1. Brief Description of Best Practices Design Process: Initiator, Main Actor and Driving Forces

It was mentioned earlier that Marikina city was the first city in Metro Manila to fully implement a citywide waste segregation program. The segregation program is organized in such a way, that waste from households, institutions and commercial establishments are already segregated at source. Biodegradable waste is collected and then finally disposed off in the Rodriguez Landfill.

On the other hand, non-biodegradable waste is brought to the Materials Recovery Facility (MRF) and sorted into recyclable and non-recyclable waste. Recyclable materials are sold to junkshops, while the non-recyclables are collected and dumped in the landfill.

In her paper entitled 'An Evaluation of the Solid Waste Management (SWM) System in Marikina City, Philippines with Comparisons to Tsukuba city, Japan' in 2006, Prof. Marideth Bravo described the flow of Marikina city's waste in the following diagram:

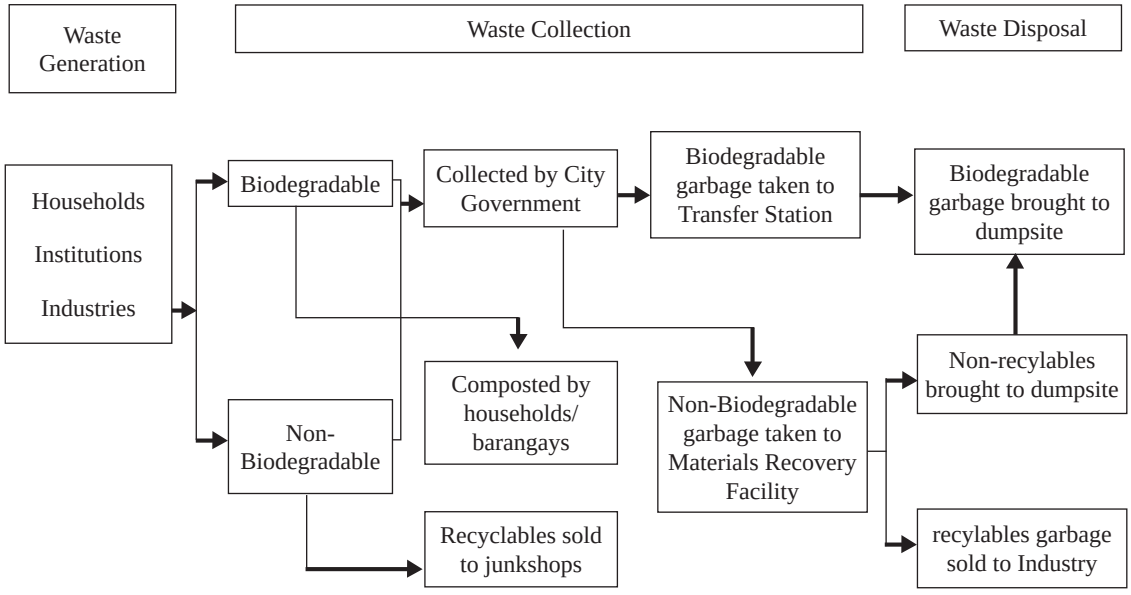

Figure 5. Marikina City Waste Flow Diagram

The eco-savers program applies the same principle on solid waste management, with a concentrated attention to the household level. The students and their parents work hand-in-hand to segregate the recyclables which are brought to school to be weighed, valued and recorded in the students' passbooks. The

process of generating the recyclables at source (household) and bringing them to school is summarized in a simplified diagram below.

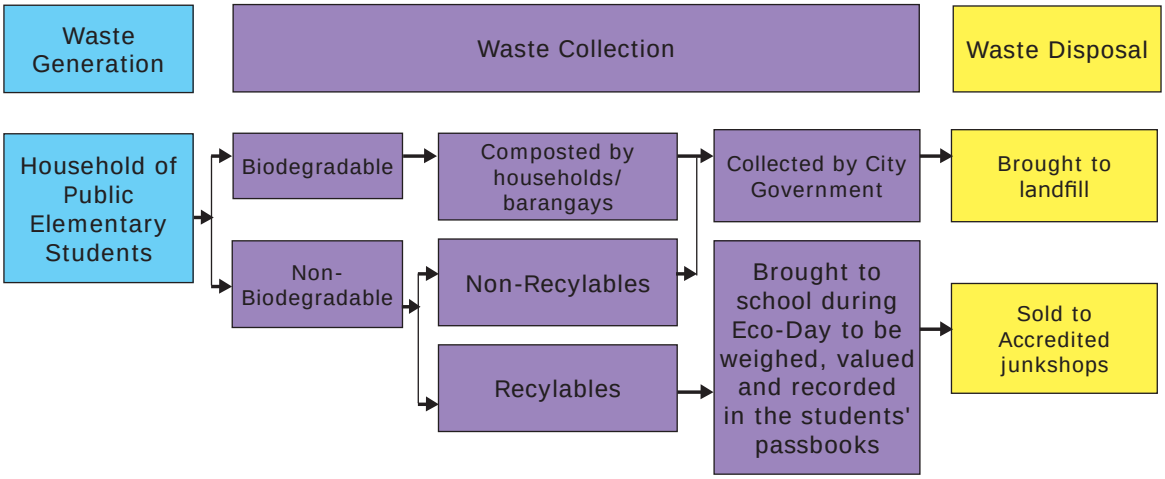

Figure 6. Marikina City Eco-Savers Waste Flow Diagram

The WMO is the prime mover of the program, fully supported by the leadership of mayor Lourdes Fernando. The WMO serves as the city government's implementing arm of the eco-savers program. It conducted a series of orientation sessions in every public school prior to the actual implementation of the program.

The program was initially presented and discussed with the Department of Education (DepEd), which eventually led to the formulation of its implemented strategies. At present, the program is still closely coordinated with the DepEd as its working partners are the 17 local public elementary schools in the city.

An Oversight Committee was created through an issued executive order, composed of DepEd officials and city government managers. The committee is responsible for the selection and accreditation of second-hand shops tasked to report to the principal on an Eco Day.

The chart below recapulates the driving forces and actors involved in the eco-savers program.

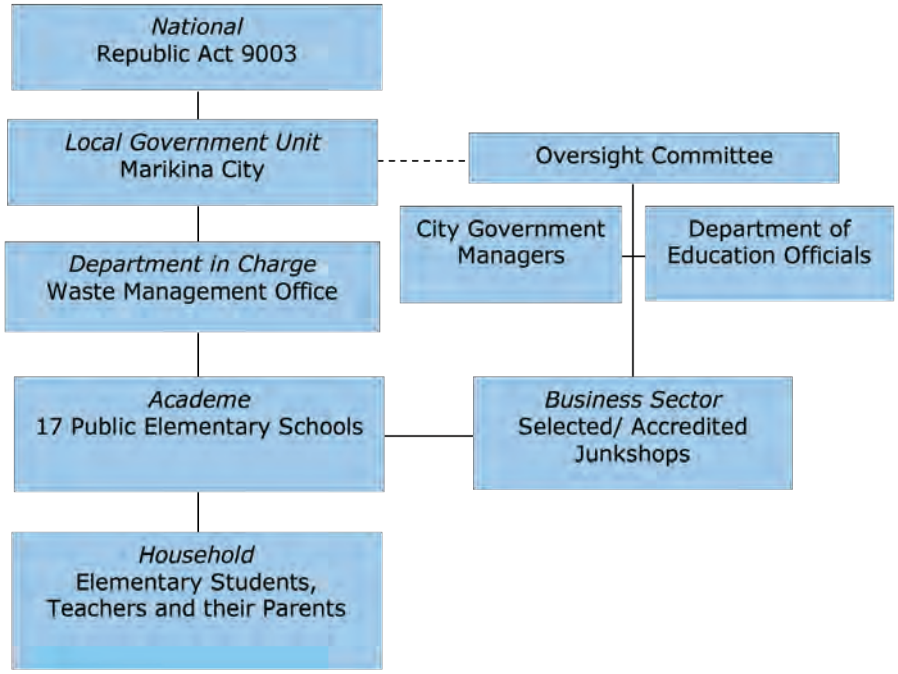

Figure 7. Eco-Savers Driving Forces and Actors

2. Functions and Roles of National Government

In 2007, the eco-savers program was awarded the Galing Pook Award as one of the most outstanding local governance programs in the country. This recognition and the support gained from the Galing Pook Foundation, a prestigious national award-giving body that searches and recognizes innovative practices by Philippine local government units, is one potent instrument to push the city in continuing to effect relevant and innovative waste management.

Galing Pook awardees are chosen from a national search of local governance programs, evaluated through a multi-level rigorous screening process based on positive results and impact, promotion of people's participation and empowerment, innovation, transferability and sustainability, and efficiency of program service delivery. The award is conferred by the President of the Republic of the Philippines. (www.galingpook.org)

Indeed, the award garnered by the Marikina city government in 2007 was another milestone in what former city mayor Marides Fernando said about her office mission in a Galing Pook Foundation interview last February 2010, "...our mission since we have been in office – to make government delightful to work with, and to deal with.
(http://www.transparencyreporting.net/index.php?option=com)

3. Role of Media

The eco-savers program was initially not launched with a big fanfare. However, the unique mechanisms in place and the success of the program naturally gained considerable attention and recognition not only from award-giving bodies but also from other LGUs. One way or another, different media venues have helped the program to become well known.

In a PROBE episode that aired on January 30, 2008, on local channel ABS-CBN, Robert Alejandro reported about the eco-savers program in Marikina city. It featured how the Eco Saver program is educating kids about the value of recycling and environmentalism, while contributing to the over-all cleanliness of the city.

In August 2008, the eco-savers program was also featured in a case study entitled Safer Cities, of the Asian Disaster Preparedness Center (ADPC). The ADPC is a regional resource center dedicated to safer communities and sustainable development through disaster risk reduction in Asia and the Pacific.

Up until the opening of another school year this year, the print media considers it always good news to feature in report articles the re-launching of the program by the newly elected mayor of Marikina city.

4. Brief Description of the Implementation Process, Legal and Administrative Conditions, Qualifications Process, Monitoring and Evaluation

The program is being implemented by the city's WMO in coordination with the Department of Education (DepEd) and is fully supported by the city's chief executive. For this purpose, the city mayor issued an executive order creating an Oversight Committee, which is composed of DepEd officials and city government managers.

The program was first presented to the DepEd on December 2003, and a series of meetings followed that resulted in the formulation of the following strategies:

- The WMO conducts a series of orientation sessions in every school to familiarize students and teachers with the objectives of the program;
- The WMO distributed the eco-savers passbooks to students and teachers of all public elementary schools in the city;
- Each of the 17 public elementary school is assigned a weekly Eco Day. There are more or less three schools that observe the same Eco Day (Monday-Friday);

- An Eco Day is the day when students are encouraged to bring recyclable garbage from their respective households; the garbage is going to be weighed and credited to their passbooks;

- The Oversight Committee is responsible for the selection of junk shops which are tasked to report to the principal concerned every Eco Day, weigh the recyclables, record them and haul all the recyclables collected. Storing the garbage within the school premises is not allowed for sanitary reasons;

- The recyclables are valued according to the prevailing market price and reflected in the individual passbook, using a point system (P1.00 = 1 point);

- Points earned shall entitle the eco-saver to shop in the eco-savers mobile store. The mobile store visits the school twice every school year, carrying educational materials such as dictionaries, books, school supplies and educational toys. An eco-saver who wishes to shop only needs to present the passbook.

5. Types of Implementation Activities

- Deliberation among the city government and DepEd officials;

- Program orientation where the city government met with public elementary school principals and Parents-Teachers Associations (PTAs) to explain the program;

- Printing and distribution of passbooks by the city government;

- Assignment of Eco Day once a week to the 17 participating public elementary schools;

- Selection and accreditation of second-hand shops by the created Oversight Committee of the city government;

- Eco bus visits twice a year – in March and December, when students get to shop using points they earned from their recyclables.

6. Civil Society and Community Involvement

Eco-savers is a program that propels people ordinary people to be ecologically concerned and solid waste management practitioners. There is a personal involvement of the population, particularly of the public elementary students and their parents – who are the key sources for recyclables brought to school.

The city government engages its public elementary students because it believes that one of the best ways of turning the eco-savers program into a success story is through school children. Involvements of school children will not only make them appreciate the value of their environment but will also develop in them a culture of savings, which they will hopefully carry with them as they grow older. With the help of their parents and teachers, students are motivated to segregate solid waste even at a young age.

The program also involves the business sector, more specifically the second-hand shops. These shops, accredited through a bidding system, are required to report to the public school principal responsible every Eco Day. They weigh the recyclables brought by the students, record the value, and haul all the recyclables collected within the day. Storing garbage within school premises is not allowed for sanitary reasons.


ECO SAVERS CLUB
MOBILE STORE
SHOP WITH YOUR ECO PASSBOOK
RESCUE 161 SPECIA


JUL 4 2007


JUL 4 2007


9 3 2006


9 3 2006

Section C. Best-Practices Evaluation

1. Sustainability of Best Practice Model

The city's reputation of dutifully implementing efficient and effective solid waste management is a strong component of the program. The city government initiated the conceptualization, determined the stakeholders, met with these stakeholders, formulated the guidelines and mechanics, printed the needed passbooks, decided on the exchangeable purchases, and finally implemented the program.

The program, including its progress, is well documented. Statistics gathered from the activities are recorded to keep track of its impact in relation to the whole solid waste management program. Financial and progress reports have also been submitted to the UNDP.

2. Major Success Factors of Marikina's Best Practice

- *Political will*

- *City government's competent Waste Management Office (WMO)*
  By implementing an efficient and effective school-based solid waste management system, the program gave the WMO greater flexibility in adopting unique strategies to reduce and recycle waste. The program created additional work for the office, considering the implementation and the amount of clerical work required for documentation. Nevertheless, the WMO felt justified in implementing the strategies of the program since it allowed the office to achieve, or even surpass, the mandated 25% waste diversion goal.

- *Initial funding from UNDP/Africa-Asia Eco Partnership*
  The UNDP/Africa-Asia Eco Partnership allowed the program to secure funding support in the initial phase of the program – making it possible for the program to meet passbook reproduction costs. In the long-term, the city government decided to undertake the passbook reproduction using own funds.

- *No financial equity required from participants*
  While there may be costs incurred by the city government in the implementation of the program, it is noteworthy that it does not require financial contribution from the participants. This is essential in helping overcome the reluctance of the stakeholders, especially the parents, to participate in the program. Instead of asking for money, the program helps with the costs of their children's school supplies which they are able to purchase using their earned points from recyclables. In effect, the program creates an economic impact, showing that there is a reward in recycling.

- *Reputation of Marikina city's people as one of the most disciplined citizens in the country*
- *Business sector support (with available facilities to haul recyclables)*
- *Mind-set preparation of parents*

3. Major Challenges and Obstacles of Marikina's Best Practice

- Waning interest in the program caused by the 'ningas cogon' mentality. The leadership of the city government should credibly sustain the implementation and avoid possible waning interest in the program caused by the 'ningas cogon' mentality. If sustained, the program's targeted participants will also sustain their confidence in the government and their active involvement.
- Unsustainable involvement of high school students.
- Bulk of clerical work requirements i.e. recording, computation, monitoring, etc.

4. Why This Model is Viewed as Best Practice

Because of its simplicity and continuing success, this program is seen positively as an example to be eventually replicated and implemented by other localities, through private or public initiative. This will help and inspire other local government units (LGUs) devise relevant ways to achieve their waste reduction and waste diversion targets within a short period of time.

The program has already been presented to the following audiences:

- Metro Manila Spouses Association conference (MM spouses are the ones handling their respective cities' clean and green program);
- Consultative conference between MMDA and the Solid Waste Managers of Metro Manila;
- DENR website of best practices;
- 5,612 Lakbay Aral groups who visited Marikina from July 2004 to June 2005, to study or look into its Solid Waste Management Program.

Most of them expressed their desire to replicate this program in their locality. In fact, they were each given a sample of the passbook. The city government is yet to hear from them on their actual replication efforts, though.

As of now, it was reported that Pasig city already adopted the program with modified mechanics. Instead of using a point system, students are given stubs in exchange for food during recess. The municipality of Daet in Camarines Norte has also adapted Marikina's model and the city's way of recycling the community's garbage, starting March 2009. Last February 2010, GMA (Cavite) also replicated the program which is called Grasya sa Basura Ecosavers Program in five participating schools.

APPENDIX A

Republic of the Philippines
Department of Education
DepEd Complex, Meralco Avenue, Pasig City

DepEd MEMORANDUM
No. 65 , s. 2010

FEB 18 2010

EARTH DAY 2010 CELEBRATION

To: Undersecretaries
Assistant Secretaries
Bureau Directors
Directors of Services/Centers and Heads of Units
Regional Directors
Schools Division/City Superintendents
Heads, Public and Private Elementary and Secondary Schools
All Others Concerned

1. The 40th year celebration of Earth Day on April 22, 2010 will be jointly sponsored by the Earth Day Network Philippines and this Department. This year's theme is Hamon ng Panahon: Climate Change, Sampung (10) Milyung Solusyon (Kilos na! Ngayon na!). Learners should begin to realize that the crisis of water depletion and contamination, air pollution and land degradation is the accumulated effect of the misuse and abuse of one's life-sources. Symbolic of these are the on-going consequences of climate change (e.g. increasing rainfall, sea level rise, rising temperature and more extreme weather) that threaten the existence and future of mankind.

2. The objectives of this year's celebration are to:

   a. instill in the learners that everyone must assume responsibility for the adverse impacts on the environment of each one's actions. This can be done by committing oneself to simple personal doable green acts (please see Enclosure No. 1 for suggestions on what each individual can do and Enclosure No. 2 on what schools can do);
   b. understand that the environment is not about the birds, the trees and the bees; rather, it is about sustaining life itself, and its sources – Lupa, Araw, Hangin at Tubig (LAHAT); and
   c. sign up to commit to effect personal behavioral changes and be part of The 10 Million Movement for the Environment (Every School Head shall consolidate the commitment of the teachers, students and parents by filling up the enclosed form – Enclosure No. 3).

3. The commitments from both public and private schools shall be submitted to the Schools Division/City Superintendents on or before March 30, 2010. School Heads are also requested to include a Report on the School Inside a Garden (SIGA) per DECS Memorandum No. 77, s. 1995 and on Community Service Component of Citizenship Advancement Training (CAT) per DepEd Order No. 50, s. 2005 particularly on addressing environmental concerns. CAT is a requirement for graduation for fourth year high school students in both public and private schools. The commitments and reports from the Schools Division Superintendent (SDS) shall be sent to:

Hon. Antonio A. Innocentes
Undersecretary for Teachers' Welfare, Department of Education
DepEd Complex, Meralco Avenue, Pasig City

4. In cooperation with the Earth Day Network Inc., a poster-making contest related to the theme shall be conducted nationwide both for private and public schools, secondary level (Enclosure No. 4).

5. A culminating program shall be held at the Bulwagan ng Karunungan in the form of a symposium featuring special numbers depicting the theme. This will be participated by student/teacher leaders and selected Education Supervisors and Master Teachers (a separate Memorandum shall be issued).

6. Immediate dissemination of this Memorandum is desired.

JESLI A. LAPUS
Secretary

Encls.:
As stated
Reference:
DepED Memorandum: No. 123, s. 2006
Allotment: 1- -(D.O. 50-97)
To be indicated in the Perpetual Index
under the following subjects:

CAMPAIGN
CELEBRATIONS & FESTIVALS
ENVIRONMENTAL EDUCATION
SCHOOLS
STUDENTS
TEACHERS

R-Maricar/DM-Earth Day
02-09-10

Enclosure No. 2 to DepEd Memorandum No. 65, s. 2010

EARTH DAY 2010
Hamon ng Panahon
CLIMATE CHANGE
10 Miyong Solusyon
(Kilos na! Ngayon na!)

WAYS TO MAKE YOUR SCHOOLS ENVIRONMENT FRIENDLY

1. **Develop environmental policies for the school such as:**
   - Stop using paper cups and styrofoam cups in the canteen. Use washable plastic glasses instead.
   - Minimize the use of paper. Use scratch paper for all internal communications. Only use clean paper for external communications.
   - Do not allow idling of vehicles while parked or waiting inside the campus.
   - Ensure that all school-owned or -leased vehicles are properly maintained and meet emission standards.
   - Do not allow smoke belching vehicles, including tricycles, into the campus.

2. **Adopt energy conservation measures such as:**
   - Change all incandescent bulbs to compact fluorescent lamps (CFLs) which consume 73% less electricity and last 13 x longer; you can join the SWITCH project of the Department of Energy to get a free CFL for every incandescent bulb turned over.
   - Better yet, shift to light emitting diodes (LEDs) which are more energy efficient.
   - Open the windows to allow sunlight and air to enter the rooms. This will reduce the need for electric fans or air conditioners.
   - Turn off air conditioners one hour before end of school. The room will remain cool.
   - Turn on the lights only when needed.
   - Turn off the lights when no one is in the room.
   - Unplug all computers, printers and other electrical appliances when not in use.
   - Buy energy efficient appliances for the school.

3. **Adopt water conservation measures such as:**
   - Make sure there are no leaking faucets and toilets;
   - Ensure no leaking hoses;

- When installing new toilets, buy those with dual flush which use less water for flushing urine.
- Teach everyone to close the faucet while soaping their hands and open it only when washing.
- Teach everyone to put water in a glass when brushing their teeth rather than allowing the water to continuously flow.
- If you have a garden, water the plants early in the morning or late in the afternoon. This will minimize evaporation.

4. **If possible, put in rain water harvesting using gutters and storage tanks. Use this water to clean the rooms, the floors, flush the toilets and water the plants. This will provide substantial savings for the school.**

5. **To minimize waste generation, encourage students, faculty and administrative staff to bring their own mugs/glasses to school.**

6. **Implement a paper and/or bottle, aluminum can recycling project. Teach everyone not to throw these materials. Encourage students to bring old newspapers, magazines and other used paper to school. Monitor performance and regularly announce it to all through the billboards within the school and during flag ceremonies.**

7. **Properly manage your solid waste:**
   - Undertake an orientation on ecowaste management for all the students, faculty and administrative staff.
   - Then, implement ecological solid waste management in the campus. Require everyone to segregate the waste at source into biodegradables (left over food, etc) , non-biodegradables that can be recycled or reused and the non-biodegradable waste that cannot be sold which become your residual waste.
   - Compost the biodegradable waste and use the compost as soil conditioner for the plants and garden within the campus. Give away or sell excess compost.
   - Sell the recyclables to nearby junk dealers.
   - Coordinate with your local government or with some environmental NGOs for the processing and/or safe disposal of the residual waste.
   - Do not burn your waste, even garden waste. This will release carbon dioxide into the air and contribute to global warming. Compost the garden waste together with other biodegradable waste. Better yet, do vermicomposting.

8. **If there is space within the school, establish a vegetable garden or a herbal garden. Use the compost for these gardens.**

9. **Better yet, implement the Ecosavers Program, similar to what Marikina City has implemented for all schools in the city.**
   - (This program is one of the winners of the Galing Pook search as a best practice of local government.) All students, faculty and administrative staff are given a passbook and are encouraged to bring all recyclable materials to school at a designated day for the different schools. These are then weighed and given points. All the participants earn points throughout the year. They

can redeem these points for school supplies and other items around Christmas and also just before school ends in March. The student/faculty/administrative staff or class that earns the most points is recognized and gets an award.

- Arrangements with buyers of the recyclables have to be made so they can pick up and buy the recyclables from the schools. This is best done in coordination with the concerned local government unit. The mechanics and the guidelines which Marikina City has adopted can serve as reference for schools that want to implement this. Look for it in their website or call their Waste Management Office at 9481204.

10. **Use organic and biodegradable soaps, detergents, other cleaning materials, insecticides and pesticides.**

11. **Ensure the physical cleanliness of the school premises.**
    - Set aside regular clean up days either weekly, every two weeks or once a month when the students and faculty will be involved. You can rotate this activity among the different grade levels or the different sections (depending on the total number of students in the school).

12. **Green the school premises.**
    - Plant grass, shrubs, trees wherever appropriate. Use only indigenous plants and teach everyone about the need to protect our biodiversity.

13. **Establish a botanical garden, a herbarium or a mini-park.**

14. **Undertake seedling production for planting within the campus or outside.**
    - Encourage students to bring seeds to school and teach them to properly raise seedlings. Coordinate with the local DENR or a local agricultural or forestry school to get technical guidance.

15. **Better yet, adopt a forest.**
    - Coordinate with your local DENR office to identify your watershed and offer not just to plant once but to adopt a portion of that watershed. Mobilize the students, faculty, administrative staff and the parents to go and plant the area and regularly maintain it. Seedlings to be planted can also be raised within the school.

16. **If you are in a coastal area, coordinate with your local DENR office and plant mangroves.**

17. **Undertake an environmental audit of school's operations and facilities.**
    - Based on the results, implement measures needed to minimize any adverse impacts on the environment.

18. **Integrate the environment into the school curriculum.**

19. **Develop environmental instructional materials**

Best Practice 13 | BP 13
Olongapo City Disaster Coordinating Council, Olongapo, Philippines

Author:
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with the full support of Local Government Development Foundation (LOGODEF), Philippines
www.DELGOSEA.eu

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Olongapo City Disaster Coordinating Council, Olongapo, Philippines

Section A. Description of Best Practice

1. Olongapo City Disaster Coordinating Council and Its Innovative Elements

As a consequence of Olongapo city's past experience of disasters, the Olongapo City Disaster Coordinating Council (CDCC) was institutionalized through City Council Resolution No.91, Series of 1985, entitled "A Resolution Establishing a Community Disaster Preparedness Program and Creating the Olongapo City Coordinating Council." Prior to the city council resolution, there had already been a directive of creating a local disaster coordinating council pursuant to Presidential Decree 1566 of 1978, in response to "Strengthening the Philippine Disaster Control Capability and Establishing the National Program on Community Disaster Preparedness."

Upon its creation, the CDCC of Olongapo assumed the following functions:

- Taking on the role of highest policy making, coordinating and supervising body for disaster management at the local level;
- Advising the city mayor on the status of local disaster preparedness and management plans; and
- Recommending to the city mayor the declaration of State of Calamity and the release of Calamity Fund to support urgent and emergency activities.

Nonetheless, Olongapo city still saw the necessity for its constituents to "prepare for, prevent, respond to and recover from disasters." It therefore ultimately became the mission, following the creation of a permanent Disaster Management Office (DMO), to further strengthen the existence of the CDCC. The creation of the DMO was made possible through City Council Resolution No.54, Series of 2002.

The DMO was established as the operating arm and secretariat of the Olongapo CDCC. It is primarily responsible for coordinating the activities and functions of key government agencies, private institutions, non-government organizations (NGOs) and civic organizations (COs) for the protection and preservation of life and property during disasters and emergencies. It also carries out the following functions:

- Coordinate CDCC's operations with local government agencies, barangay disaster coordinating councils (BDCCs), and other support agencies and non-government organizations;

- Develop and coordinate programs for information, education and training of the local population, DCCs concerned, volunteer workers and the like;
- Formulate plans and policies for the protection and preservation of the welfare of the local population in times of calamities and other emergencies;
- Implement laws, plans and programs in relation to disaster prevention, preparedness, mitigation, response and reconstruction/ rehabilitation;
- Provide economical, efficient and effective services to the victims and potential victims of calamities inside and outside the area of responsibility (AOR);
- Monitor and supervise the smooth implementation of the approved CDCC Annual Work and Financial Plan.

Among the CDCC/DMO's innovative features are the following:

- Strategic and holistic approach to disaster management from mitigation, preparedness, response to rehabilitation;
- A competitive Olongapo Fire-Urban Search and Rescue Team;
- Disaster-specialized services;
- Community-based disaster management systems.

2. Reasons for Program Development, Shortcomings and Challenges Addressed by Best Practice Model

Although the CDCC has already been in existence since 1985 pursuant to City Council Resolution 91, the "Twin Mega Disasters of the 1990s" led to it being strengthened further and eventually to the formal creation of the DMO.

The Twin Mega Disasters of 1990s which heavily affected Olongapo city were: the catastrophic Mt. Pinatubo eruption and the pull out of the US Naval Base in 1991. Over 360 communities and 2.1 million people were indirectly or directly affected by the Mt. Pinatubo eruption. The city, which is relatively close to the location of the volcano, was covered in ash and volcanic mudflows (called lahar) when it rained. This historical eruption claimed hundreds of lives, displaced thousands of others, and devastated much of the city's property and livelihood.

Widespread damage to the US facilities coupled with the Philippine Senate's decision to reject the extension of its operations in the Philippines booted out the US Naval Base in 1991. As a consequence of the American soldiers leaving

their base, more than 40,000 Filipinos were left without a job. Losing its major income-generating patron, Olongapo city even became downtrodden with yet another economic 'disaster'.

Problems loomed afterwards and the city was left trampled and helpless, but the Twin Mega Disasters of 1990s served as the wake-up call for Olongapo city. The same disasters made both the city government and its constituents come to the following realizations that brought about the establishment of a permanent disaster management office:

- Comprehensive planning ahead for disasters is critical for managing them;
- The leadership and support of the local government vis-à-vis the active participation of the people volunteering for social transformation lays the groundwork for immediate recovery after disasters;
- The participation of people from the grassroots level has been considered as the most valuable lesson that Olongapo city learned from past disasters.

Armed with these lessons, Olongapo city created the DMO in 2002 to bring about the existence of the CDCC. The DMO has the vision to prepare the city for disasters by ensuring that all individuals, government and non-governmental organizations know the risks they face, are able to make decisions that will keep them out of danger, and acquire knowledge and skills they need when disasters strike.

The following are the DMO's objectives:

- Reduce loss of life and property;
- Minimize suffering and disruption caused by disasters;
- Achieve rapid and sustainable development through effective Disaster Management.

3. Results Achieved and Relevance to Public Life

In its eight years of existence, the CDCC/DMO has evolved from a local office responsible for saving and protecting lives and properties into a well-recognized organization committed to saving lives and properties not only within the boundaries of Olongapo city, but also in other areas of the Philippines where help during disasters is needed.

Below is a summary of the results achieved since the inception of the CDCC/ DMO:

- **Recognition and Awards**

  Olongapo's CDCC has been a five-time recipient of the National Gawad Kalasag Award for Excellence in Disaster Preparedness and Response as the Best Disaster Coordinating Council (Highly Urbanized City Category) in the years 2002, 2003, 2007, 2008 and 2009 given by the National Disaster Coordinating Council (NDCC). By receiving the said award for three consecutive years, the CDCC is now included in the Kalasag Hall of Fame, not to mention it also being the lone Regional Gawad Kalasag Hall of Famer on the local scale. The Kalasag Award aims to recognize the outstanding performance of disaster coordinating councils in the implementation of their disaster management programs and activities, and in providing humanitarian assistance and effective emergency response.

  The core response group of CDCC/DMO, the Olongapo City Fire-Rescue Team (OFRT), also bagged the National Gawad Kalasag Award as the Best Government Emergency Responders (GOERS) for the years 2004, 2006, 2007 and 2008. The said response group earned the National Gawad Kalasag Hall of Fame last August 01, 2008.

  Another hallmark for the OFRT in being one of the best rescuers in the Philippines was its selection to represent the country as the Philippine Urban Search and Rescue (USAR) Team during the 3rd ASEAN Regional Disaster Simulation Exercise (ARDEX) in Singapore. The team joined other high-caliber rescue teams from other Southeast Asian countries including Singapore, Cambodia, Laos, Brunei Darussalam, Indonesia, Malaysia, Myanmar, Thailand and Vietnam. Organizations from the United Nations and foreign dignitaries from around the world also graced this regional capability exercise.

  Other awards collected by the CDCC/DMO are the following:

  - 2007 Overall Champion and Best in Situational Analysis Focus on Immobilization, 4th Regional First Aid and Basic Life Support Olympics;
  - 2006 1st Runner Up and Best in Situational Analysis Focus on Immobilization, 3rd Regional First Aid and Basic Life Support Olympics;
  - 2005 2nd Runner Up and Best in Situational Analysis Focus on Spine Board Management, 2nd Regional First Aid and Basic Life Support Olympics;
  - 2004 Overall Champion and Best in Situational Analysis Focus on Immobilization, 1st Regional First Aid and Basic Life Support Olympics.

- **Earned Trust of the City Constituents and Investors**
  Flattering as reaping national and international recognition is, it is far more rewarding for the CDCC/DMO to earn the trust of its people: that with the council around, Olongapo city is all set to face disasters. Mayor James Gordon, Jr. himself believes that people are already convinced that they are safe simply through the presence of the CDCC/DMO. He said that the CDCC gave them a feeling of security. In fact, the annual peace and order parade, showcasing the police force and disaster team, has helped the city show that it is a city prepared for disasters and is well organized. Mayor Gordon adds that if people see the disaster team, it is clear to them that someone will come to respond to them in case of fire and emergencies.

  Mayor Gordon is determined to sustain the CDCC because it helps the city. A good disaster management team is a bonus when selling to investors. If investors know that Olongapo city has a good disaster management team, they would want to put their business in the city because they are at peace that in the event of disasters or emergencies, they would be able to use it. In essence, the CDCC makes the city safer.

- **Established and Coordinated Local Disaster Management Capability**
  Due to the existence of the DMO which coordinates disaster management operations of the city, members of the CDCC recognize the importance of disaster awareness and preparedness to effectively help the city government address calamity situations. There is an organized structure of the CDCC and a clear delineation of tasks among players: government agencies, NGOs, COs and even private companies. Certain committees and task units are formed and roles and responsibilities of each are already identified to facilitate cooperation in the CDCC. The members regularly conduct meetings to tackle relevant plans and programs on disaster mitigation, preparedness, response and rehabilitation. In effect, the CDCC structure has also instilled the values of dedication and reliability into its members. It gives them a sense of professional pride in performing their tasks.

  Through the initiation of then Olongapo city mayor Katherine Gordon and Philippine National Red Cross (PNRC) Chairman Senator Richard Gordon in 1997, the Rescue Team (then known as Kabalikat Sa Hirap at Ginhawa (KHG)) was created to serve as the emergency response unit of the CDCC/DMO. It was later renamed the Fire-Urban Search and Rescue Team. It is composed of private volunteers and government responders complementing the Bureau of Fire Protection (BFP). The team provides immediate assistance to victims of disasters and coordinates with the BFP for quick and orderly rescue operation in different situations, especially in handling fire suppression.

  The team also deputizes as fish wardens. With respect to harbor patrol duties, the team enforces the laws and ordinances relative to the protection of Olongapo beaches and marine resources in close coordination with the Department of Environment and Natural Resources (DENR), the Philippine National Police (PNP) and other concerned agencies.

The skills competencies and credibility of the team are products of character as well as sustained trainings and exercises the team members participate in. Among the specialization and services the team provides are the following:

1. Disaster Assistance;
2. Fire Suppression;
3. Emergency Medical Services;
4. Post Disaster/Emergency Cleaning Operations;
5. Collapsed Structure Search and Rescue/Urban Search & Rescue (CSSR/USAR);
6. Water Search and Rescue (WASAR);
7. Relief Operations;
8. High Angle Rescue;
9. Earthquake Drills and Simulation Exercises;
10. Flashflood Simulation Exercises;
11. First Aid and Basic Life Support Training;
12. Blood Donations;
13. Special Operations.

- **Cascaded Community-Based Disaster Management**

The structure of the CDCC is also replicated on the barangay/community level where Barangay Disaster Coordinating Councils (BDCC) are formed. Each of the 17 barangays have an emulated CDCC. They all took part in a planning workshop on Community-Based Disaster Risk Management where the barangay disaster managers were educated on the Philippine Disaster Management System, Contingency Planning for Disasters, Hazard Mapping and Incident Command System.

Brgy. Sta. Rita, the largest barangay of Olongapo city in size and population, also emulated the creation of a disaster management office on the community level. It has its own Fire Rescue and Disaster Response Unit with the primary duty to respond to required fire suppression assistance within and outside of the barangay. Other than responding to fires, the unit was also designed to respond to emergency situations, disaster control, collisions and accidents needing emergency measures in order to save lives and property. This scheme of an organized BDCC structure is planned to be adopted even on the purok level.

Day Care workers based in the barangays are also trained to administer first aid and basic life support to toddlers under their supervision. This reinforced the pool of responders of the CDCC in cases of disasters, giving special attention to children's safety in preschool.

Not only does the culture of having an organized structure works to the advantage of the institutional environment but it benefits the community as well. It is noteworthy that participatory governance is encouraged at grassroots level.

- **Creation and Standardization of the Emergency Response Plan**
  The Olongapo CDCC developed a manual called the Emergency Response Plan (ERP) in order to provide its members and emergency responders with comprehensive, standardized and handy guidelines and procedures in responding to disasters and emergency situations. The manual administers a citywide emergency plan on an all-hazards approach that includes the following:

  1. Landslide;
  2. Typhoon;
  3. Flashflood;
  4. Earthquake;
  5. Oil Spill;
  6. Aircraft Crash;
  7. Fire due to terrorist attacks.

  Aside from providing a specified full-range response approach to various hazards, the ERP also serves as a reference for coordination of actions of the different clusters involved in disaster management such as:

  a. Camp coordination, emergency shelter and protection;
  b. Fire;
  c. Food and nutrition;
  d. Livelihood and agriculture;
  e. Response and rescue;
  f. Health and water sanitation and hygiene;
  g. Emergency telecommunication;
  h. Logistics.

  The ERP is regularly evaluated and updated as needed - based on previous disaster experiences and developments of more relevant response procedures. Moreover, the DMO is also encouraging the different government agencies, non-government organizations and BDCCs to develop their respective emergency response plans.

- **Minimized Casualties and Damage to Property**
  The reduced number of casualties and prevention of large-scale damages to the city is by far the most important and satisfying result of the creation of CDCC/DMO. According to Olongapo CDCC Executive Officer and DMO Chief Angelito Layug, the council will not stop in its attempts to achieve zero casualties at all times.

- **Extended Assistance and Capabilities Outside Area of Responsibility**

  It is noteworthy that the CDCC/DMO of Olongapo city is not limiting its services to the city boundaries, but is also extending assistance to areas outside of its responsibility when needed. In coordination with other concerned CDCCs, government agencies or private parties requiring assistance, the Olongapo CDCC/DMO selflessly lends its relentless efforts and resources for search, rescue, retrieval, relief, recovery and rehabilitation operations.

  Among the major assistance operations extended by the CDCC/DMO outside Olongapo city are the following:

Activity	Location	Date
Water Search and Rescue Operation for Victims of Typhoon Pepeng	Pangasinan	October 2009
Water Search and Rescue Operation for Victims of Typhoon Ondoy	Cainta, Rizal/Antipolo, Rizal and Metro Manila	September 26-30, 2009
Water Search and Rescue Operation for Victims of Typhoon Kiko	Botolan, Zambales	August 06-08, 2009
Search, Rescue and Retrieval Operation for Benguet Gold Miners	Itogon, Benguet	September 28, 2008
Fire Rescue Operation	Brgy. Wawa, Abucay, Bataan,	August 29, 2008
Portable Water Distribution and Relief Operation for Victims of Typhoon Kosme	Candelaria and Sta. Cruz, Zambales,	May 2008
Search and Rescue Operation for Victims of Typhoon Winnie	Cabanatuan City, Nueva Ecija	November 30, 2004
Rescue Operation for Victims of Typhoon Maru	Paniqui, Tarlac	August 27, 2004
Task Force Kapatid Rehabilitation of Power Lines for Affected Areas of Typhoon Harurot	Santiago City, Isabela	August 27, 2003
Financial Assistance and Relief Operation	Aurora Province	August 8, 2003

Activity	Location	Date
Relief, Search and Recovery Operation for Victims of Lupang Pangako Landslide	Payatas, Quezon City	July 11, 2000
Portable Water Distribution and Relief Operation for Victims of Mayon Volcano Eruption	Albay	March 3, 200

Table 1. Major Assistance Extended by CDCC/DMO to Areas Beyond Its Areas of Responsibility (AOR)

Not only does the CDCC/DMO extend assistance to areas outside its responsibility, it also willingly shares its technical capabilities with other groups and localities concerning disaster management in the form of trainings, orientations and sharing of best practices.

Activity	Recipient / Trainees	Date
Disaster Preparedness and Management Orientation	Provincial Disaster Coordinating Council of Nueva Ecija	November 2009
Disaster Risk Management Orientatio	Dinagat Islands Search and Rescue Team	September 11, 2009
Water Search and Rescue Training	Bataan Rescue Group	May 25-29, 2009 Olongapo City
Water Search and Rescue Orientation	Cabanatuan Rescue Team	April 3, 2009 Driftwood Beach
Ambulance Management and Supervision Training	Mariveles Rescue Medics	January 26, 2009, Mariveles, Bataan

Table 2. Trained/Oriented Groups by the CDCC/DMO

The CDCC/DMO continues to instill the culture of preparedness and alertness for disasters among its city constituents.

4. Description of Olongapo City

Olongapo city is located in the southernmost entry point of the province of Zambales, on the western coast of Luzon. It is bordered by the town of Subic to the north, by the province of Bataan to the east, by the Subic Bay Freeport Zone to the south, and by Subic Bay to the west. It lies 127 kilometers north of Manila, which translates to an average of a three-hour drive.

With a total land area of 185 square km (18,500 hectares), only 13.56% or 25.08 square km of Olongapo city is made up of built up area. The total land area is divided into 17 barangays namely: New Asinan, New Banicain, Barreto, East Bajac-Bajac, East Tapinac, Gordon Heights, Kalaklan, New Kalalake, Mabayuan, New Cabalan, New Ilalim, New Kababae, Pag-asa, Sta. Rita, West Bajac-Bajac, West Tapinac, and Old Cabalan. According to the latest official census, the city has a population of 227,270 people in an estimated 50,300 households.

Olongapo city is defined by rugged and mountainous terrain. Two mountain ridges boast of steep slopes: the Kalaklan Ridge on the northern tip of the city and the Salimpuyo Ridge on the western side. Almost 80% of the city's land area has slopes greater than 18 degrees, thus the portion of land available for urban development is constrained. Moreover, because of the city's topography, it exposes itself to episodes of possible landslides and erosion.

Strong waters from the surrounding mountains flow to the Sta. Rita River Basin, which is the main water source of Olongapo city. Its main river is the Sta. Rita River, streaming down into Subic Bay. When the Sta. Rita River overflows, most of the areas in the city are affected by chronic floods. Brgy. Sta. Rita's land elevation is below sea level and is labeled as the flood plain of the city.

Since the city lies in a province in the western region of Luzon, typhoons coming from the eastern region of the archipelago recurrently hit the area as these trace the path out toward the South China Sea. Typhoons affecting the city are typically characterized by heavy rain and strong winds contributing to floods, flash floods and landslides. The city's susceptibility to a number of natural hazards also includes occurrences of earthquakes and volcanic eruptions as it is found to be prone to seismic activities attributed to that of Mt. Pinatubo and the Manila Trench.

For several years, Olongapo city served as a major US Naval base until it was formally turned over to the Philippine government in 1992. Although the pullout dramatically affected the economic condition of the city, it also marked the dawning of the U.S. naval facility's successful transformation to a Freeport and special economic zone then led by Richard J. Gordon. This significantly helped the city revive its economic status as the transformation created employment opportunities and welcomed business investors.

Considered as a local government unit (LGU) and now as a highly urbanized city, Olongapo city is governed by a city mayor who is elected directly by the people and holds office for three (3) years. The city mayor is the local chief executive who works with a city council as the city's legislative body.

The city boasts of its renowned spirit of volunteerism, which essentially saved the city from languishing in economic and physical misery, caused by the Twin Disasters of the 1990s – the Mt. Pinatubo eruption and the pullout of the US

Naval base from the city. Up until today, volunteerism is still evident in the city's system – from its governing leaders down to the citizens themselves.

Its present governance battle cry, "Fighting for excellence", is a reflection of how the city strives endlessly for improvement, despite already reaping awards and commendations for best practices in local governance including in the domain of disaster management.

5. Budget for Best Practice Implementation

When the DMO was created, it was assumed that the office would operate under the city mayor's office. Among others, its implementation costs would include personnel and operational expenses. Funds to cover these expenses are obtained from the 5% of the local calamity fund allocated by the city government. LGUs are given the autonomy to use this portion of their calamity funds as discretionary spending, in accordance with NDCC guidelines and in coordination with the Department of Budget and Management (DBM).

Apart from covering the personnel and operational expenses, the city government invests in equipment and facilities that would help the CDCC/DMO in the implementation of its programs and activities. It invested in mobile rescue units in the form of an ambulance, a rescue van, a tanker truck, a generator truck and a pumper.

However, the acquisition of equipment and facilities does not solely depend on the city government. Some equipment was passed on or donated by local partners, counterparts and international agencies. Among the donated equipment are:

- Flood Early Warning System devices (UNDP Ready Project and MGB);
- Digital/Manual Rain and Water Level Gauges (UNDP Ready Project and PAGASA);
- Personal protective equipment (Vernier Sapeurs Pompiers Fire Brigade of Switzerland);
- Special search and rescue tools, equipment and accessories (Bicol Calamity Assistance and Rehabilitation Effort Commission (BCAREC).

6. Specific Technical Expertise

One area of initial concern for the CDCC was the lack of technical expertise in disaster management. The National Disaster Coordinating Council (NDCC) under the Department of National Defense (DND), through its Office of Civil Defence (OCD) Training Division, provided technical assistance to help CDCC develop and coordinate programs for informing, educating and training its members.

Section B. Methodology in Design and Implementation of Best Practice

1. Brief Description of Best Practices Design Process: Initiator, Main Actor and Driving Forces

The accomplishment of establishing a permanent office to address disaster-related concerns in Olongapo city did not happen overnight. It took the city years of arduous effort for the formation, preparation and training, development and then finally the creation of a CDCC/DMO that is a manifestation of a strong edifice able to brave the challenges of impending disasters.

The table below describes the evolution of CDCC/DMO until its start of operations:

Date	Activity	Key Persons Involved
1985	Approval of the City Resolution No. 91 "A Resolution Establishing a Community Disaster Preparedness Program and Creating the Olongapo City Disaster Coordinating Council"	City Councillors
July 1997	Organization of the Kabalikat Sa Hirap at Ginhawa (KHG) Fire Rescue Team	Mayor's Office with Senator Richard Gordon
June 6, 2002	Approval of the City Resolution No. 54 "A Resolution Creating the Olongapo City Disaster Management Office"	City Councillors
2002	Appointment of Chief and Personnel and Start of Operation	Mayor's Office

Table 3. Highlights of the Creation of the CDCC/DMO

It was former Olongapo city mayor Katherine Gordon and Philippine National Red Cross (PNRC) Chairman, Senator Richard Gordon who pushed for the strengthening of the CDCC and the creation of the DMO.

The CDCC integrates a wide spectrum of disaster and rescue-related stakeholders. It strung together various city government departments and agencies key personnel, barangays, government emergency responders, NGOs and COs, volunteer organizations and private individuals. Committees and task units are formed and roles and responsibilities of each are identified to facilitate coordination and cooperation of the CDCC operations.

Below is the structural organization of the Olongapo CDCC headed by a chairman in the person of the city mayor.

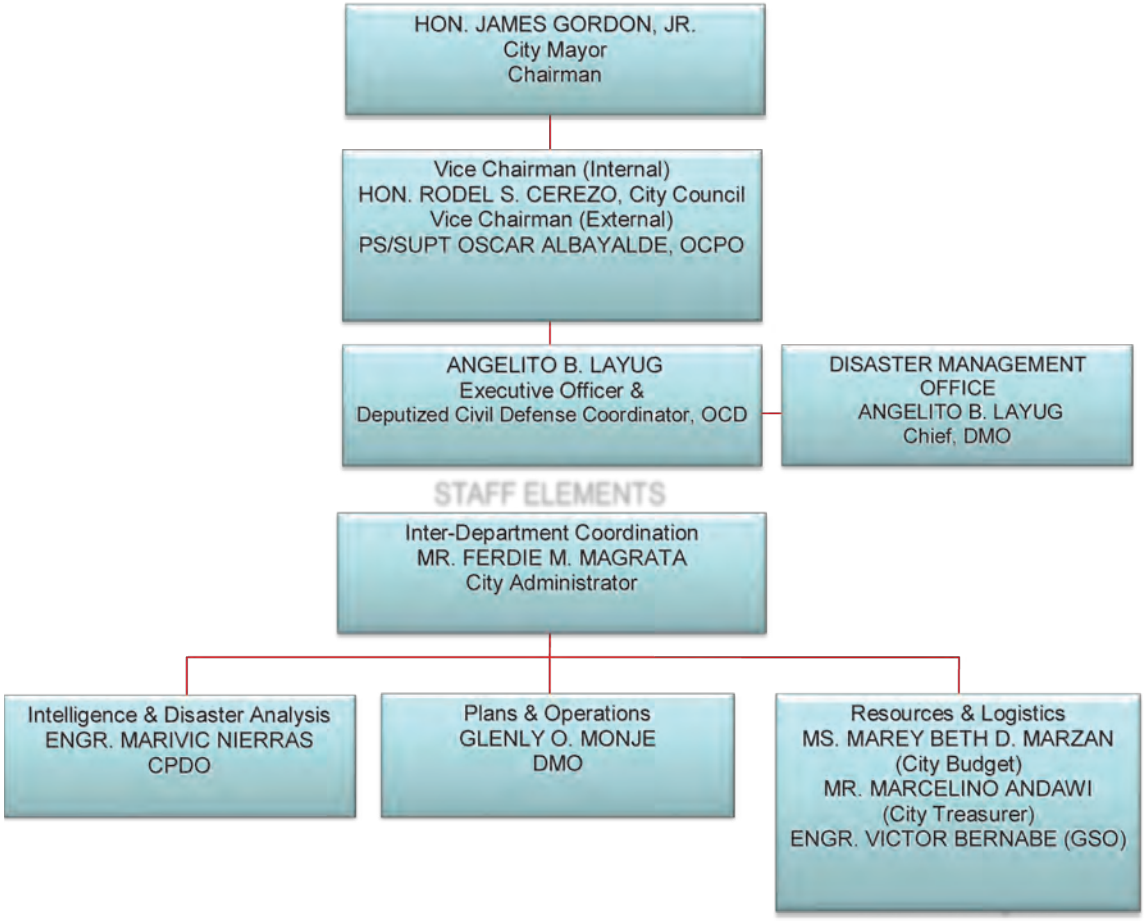


Figure 1. Staff Elements of the Olongapo CDCC

The following are the task units formed and the corresponding point person/s.

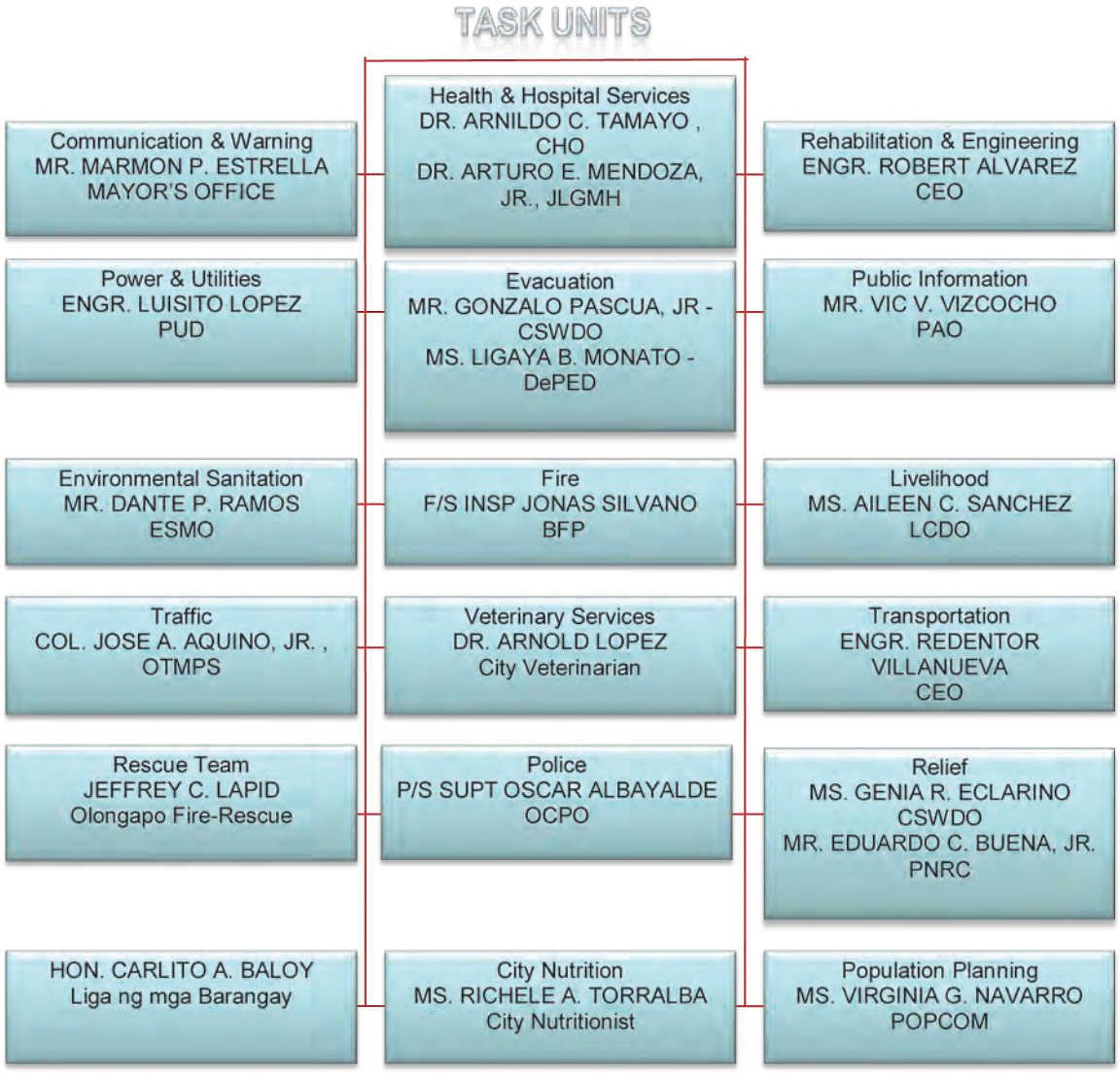


Figure 2. Task Units of the Olongapo CDCC

Below is the diagram showing the involvement of national government agencies and various NGOs, COs and private companies in the CDCC.

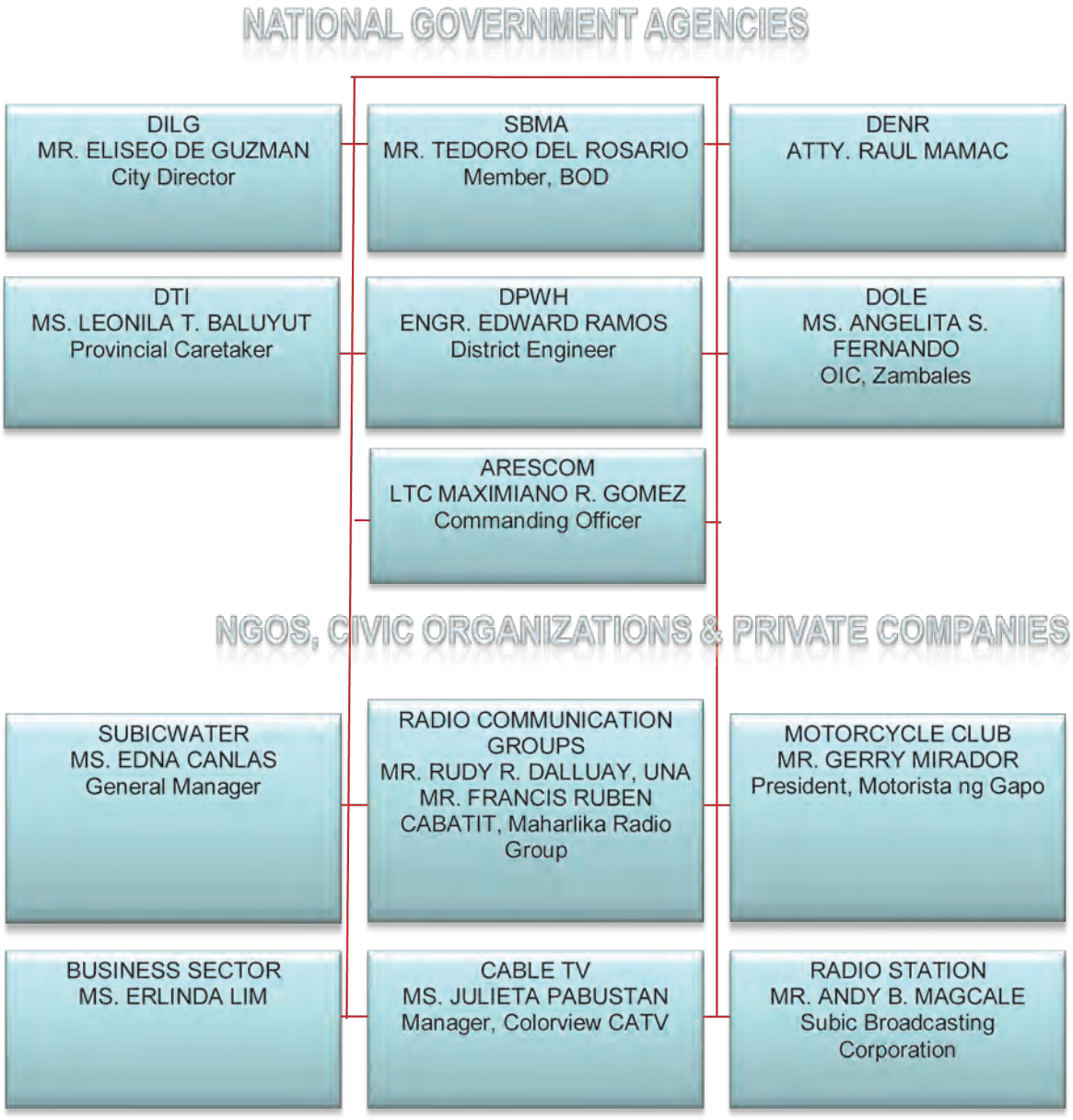


Figure 3. Key Related Government Agencies, NGOs, COs and Private Companies

The DMO is staffed by more than 25 trained, knowledgeable and competent personnel, who are experienced in dealing with disasters and emergencies. The DMO organizational structure is illustrated below.

Figure 4. Organizational Structure of the DMO

The following are the committees formed and their composition.

MITIGATION COMMITTEE	
Chairperson	City Planning and Development Officer
Co-Chairperson	Chief Executive Office
Members	ESMO
	PUD
	City Agriculturist
	City Budget Office
	PAO
	DMO
	CSWD
	LCDO
	PNP

PREPAREDNESS COMMITTEE	
Chairperson	DMO
Members	DepED
	CHO
	PNP
	DILG
	BFP
	PAO
	PNRC
	CPDO
	LCDO

RESPONSE COMMITTEE	
Chairperson	CSWD
Co-Chairperson	DMO
Members	CEO
	DTI
	CENRO
	CHO
	DepEd
	TMB
	City Budget Office
	City Treasury Office
	DILG
	PNRC
	PNP
	BFP
	PAO
	Volunteer Group Representatives

REHABILITATION COMMITTEE	
Chairperson	City Budget Office
Members	CPDO/CEO
	CSWD
	CHO
	DILG
	CENRO
	City Agriculturist
	LCDO
	DMO
	PNRC
	PAO
	PNP
	NGO/PO Representatives
	City Treasury Office

2. Functions and Roles of National Government

Although the institutionalization of the DMO implies decentralization and local self-reliance capacities of the city government of Olongapo, its elevation to an independent department was not approved by the Civil Service Commission (CSC) and the Department of Budget and Management (DBM).

3. Brief Description of the Implementation Process, Legal and Administrative Conditions, Qualifications Process, Monitoring and Evaluation

The disaster management programs of the CDCC are divided into four major interrelated phases namely: mitigation, preparedness, response, and rehabilitation.

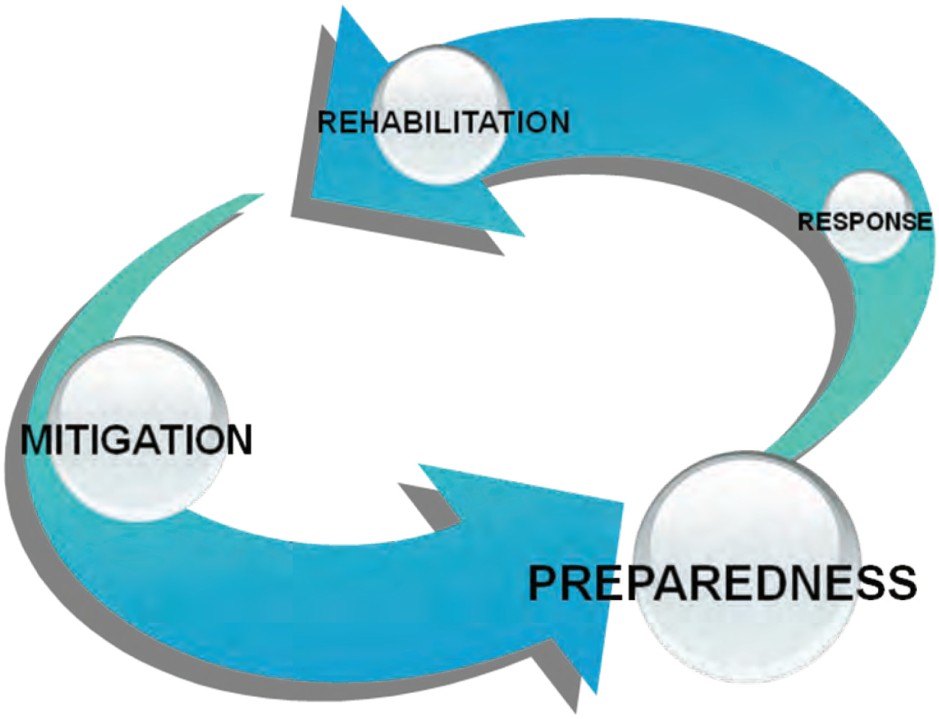
Mitigation programs are in place to minimize the chance of a disaster occurring as well as to reduce, if not eliminate, the long-term risks of disasters to human life and property.

Preparing the city is also necessary to prevent or minimize the impact of disasters. Planning and arming the city constituents with relevant know-how in the event of disasters are key strategies of preparedness.

Response immediately comes at the onset of and after disasters or emergencies. This phase aims to provide emergency aid to casualties of disasters and includes such activities as search, rescue and even retrieval operations. There are also post-disaster/emergency measures rendered in this phase.

The rehabilitation phase is intended to administer assistance for recovery from disasters and for the restoration of the various systems in the city.

Figure 5. Phases of Olongapo CDCC's Disaster Management



4. Implementation Activities

4.1 On Mitigation

There are two different approaches in implementing the mitigation activities of the CDCC: structural and non-structural.

Structural mitigation would refer to the creation, restoration, maintaining or modification of governmental, commercial or private structures in order to support or manage disaster management operations in the city. The following are the structural mitigation activities of the CDCC:

- River Dredging Operations;
- River Desilting Operations;
- Repair and Rehabilitation of Kalaklan Lighthouse;
- Kalaklan River Jetty Protection Walls;
- River Clean-Up;
- Upgrading of Flood Control Gate;

- Drainage System Maintenance and Clean-Up;
- Installation of warning signs and billboards in landslide prone areas;
- Installation of Rain/Water Management System such as:
  - Digital rain gauges
  - Water level gauges;
- Completion of Risk Susceptibility and Vulnerability Maps and Identification of Landslide, Flood Hazard, Tsunami Hazard, Fire Hazard Areas.

On the other hand, the non-structural mitigation approach focuses on human activity and public information programs to create awareness among the constituents of Olongapo city. Non-structural mitigation activities include:

- Seminars on Community Based Flood Early Warning System;
- Disaster Profiling Integrated into the Community Based Monitoring System;
- Information and Education Campaigns (IECs).

The DMO conducts information and education campaigns aimed at communities about the risks, where the risk areas are and mitigation techniques they can use to protect their families and properties. Particularly, the DMO conducts IECs on:

- Rain induced landslide conducted in areas at risk;
- Flash floods conducted in flash flood prone area.

4.2 Preparedness Activities

Preparedness covers activities like:

- Contingency Planning;
- Development of the Emergency Response Plan;
- Establishment of a Community Based Emergency Warning System;

- Installation of emergency motor sirens in strategic locations in the city with the following objectives:

  - To warn the public of upcoming disaster;
  - To remind the public of the importance of immediate reaction;
  - To protect minors from possible dangers they may encounter at night.

- Flood early warning systems such as the Colors of Beauty and Safety with the following indicators:

  - RED PAINT (from 4 to 6 feet) – High Risk. The area should be cleared. Everyone should be safe in the evacuation centers;
  - GREEN PAINT (from 2 to 4 feet) – Evacuate. Families should evacuate their homes and go to their assigned evacuation centers;
  - YELLOW PAINT (from 0 to 2 feet) – Get Ready. Families should secure all of their possessions and prepare necessary items for evacuation;

- Flood/flash flood prone areas early warning signage:

  - Mobilization of barkers or the mobile television.
  - Release of a periodical publication, The Guardian.
  - Creation of the Olongapo CDCC website.
  - Identification of evacuation and staging centers.

Presently, the city utilizes the national high school as its primary evacuation center. However, DMO chief Angelito Layug said that the city is now working on a plan to put up a permanent evacuation center and identifying possible relocation sites.

4.2.1 Participation in various capability seminars and trainings of the Fire-Urban Search and Rescue of Olongapo City

Mayor James Gordon, Jr. was appointed by former President Gloria Macapagal-Arroyo as head of the Central Luzon Disaster Assistance and Rescue Trainings (DART). In this role, he ensures that members of the CDCC are receiving relevant training to build up their competitive and responsive skills. Among the trainings referred to are:

- Water Search and Rescue (WASAR) Training;

- Collapsed Structure Search and Rescue/Urban Search and Rescue (CSSR/USAR) Training;

- Ambulance Management and Supervision;

- Disaster Risk Management Training/Orientation;
- Disaster Risk Management (DRM) Workshop for Community Leaders;
- Rapid Damage Assessment and Needs Analysis (RDANA) Training-Workshop;
- Contingency Planning Formulation Workshop;
- Deputation of Barangay Captain to Issue Warning/Weather Advisories for Fisherfolks;
- Community Based Early Warning System;
- Disaster Simulation Exercises;
- ASEAN Regional Disaster Simulation Exercises;
- International Search and Rescue Advisory Group Asia-Pacific Earthquake Simulation Exercise (INSARAG);
- Earthquake Preparedness Static Display and Response Exercise;
- Conduct of building emergency evacuation plan drills and exercises for commercial, government and industrial establishments;
- Conduct of Earthquake Safety Drill in Schools.

The CDCC/DMO, in strict coordination with the Department of Education (DepEd) in Olongapo city, achieved a 100 % participation rate of all elementary, secondary and tertiary public and private schools within the city in a series of earthquake safety drills.

4.2.2 Organization of volunteer groups such as:

- Olongapo Civil Security and Safety Unit which is responsible for enforcing all laws and ordinances relative to the protection of lives and government properties and for taking all necessary steps to ensure public safety, peace and order in coordination with the local PNP and appropriate agencies.
- Radio Communication Groups including Una, Maharlika, Radyo Gapo, Kabayan, and the Riders Club. These groups provide the CDCC access to its facilities by relaying information to concerned agencies in times of emergencies and disasters. They mobilize their members in their commitment to cooperate with the DMO with regards to disseminating important information to the public during emergencies and disasters. They advise the office of the city mayor and the DMO in case

of any emergency that requires the assistance of the DMO and advise the DMO of any problems encountered or developments in their communication facilities.

- Barangay Volunteer Fire-Rescue Brigades from Brgys. Gordon Heights, New Cabalan, Sta. Rita and Barreto. They serve as the first responders in their respective areas of responsibility (AOR) during emergencies and disasters. They initially assess a situation within AOR and provide recommendations to appropriate agencies.

- 306 (ZAM) CDC, 3RCDG, Army Reserve Command. Just like the barangay volunteers, these groups serve as the first responders in their respective AOR during emergencies and disasters. They also initially assess a situation within AOR and provide recommendations to appropriate agencies.

- CSWDO Day Care Workers serve as the first responders in day care centers/schools during emergencies and disasters. They initially a assess situation within AOR and provide recommendations to appropriate agencies.

4.3 On Response

Among others, this phase includes activities such as:

- Disaster assistance;
- Emergency services;
- Collapsed structure search and rescue;
- Water search and rescue operations;
- High angle rescue operations;
- Fire suppression;
- Post-disaster/emergency clearing operations;
- Damage assessments.

4.4 On Rehabilitation

Assistance for recovery from disasters is provided through infrastructure programs and human services assistance programs, such as:

- Center for Assistance, Rehabilitation and Empowerment;

- Support Institutions such as the Social Development Center to provide counselling services to victims of catastrophic loss.

5. Documentation / Visualisation of Activities

Contingency Planning Formulation Workshops of the CDCC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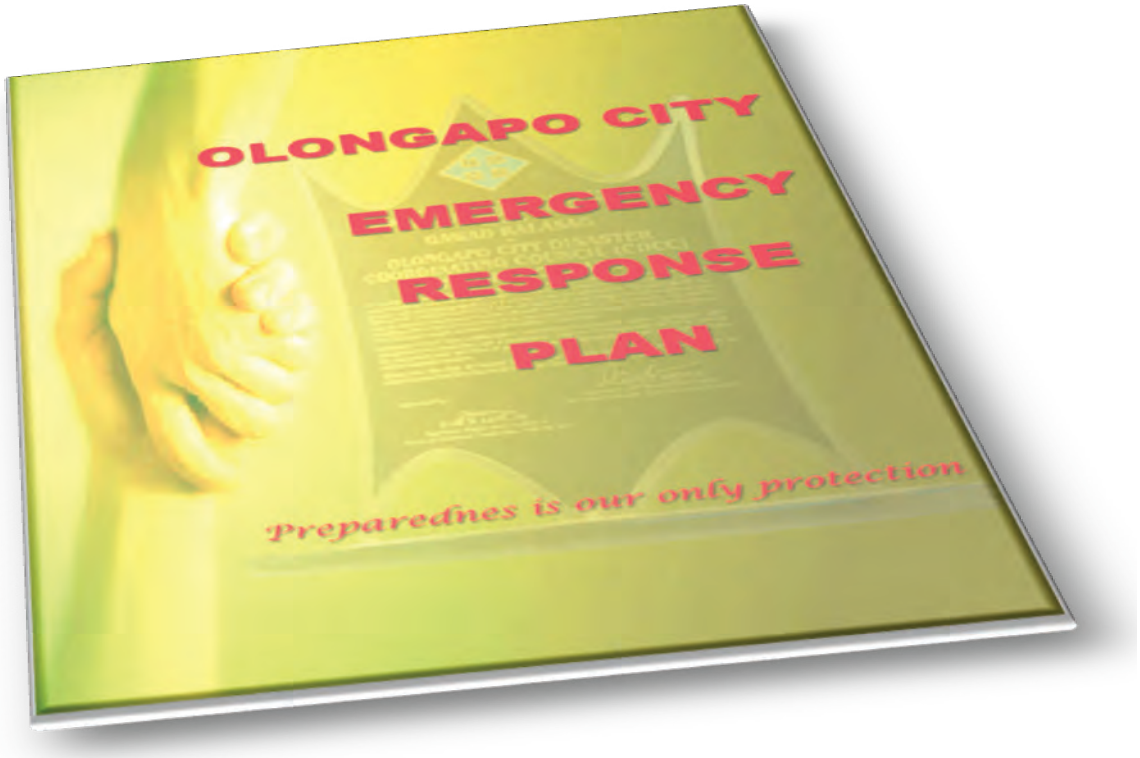
Preparedness

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Response Activities

Rehabilitation Programs

6. Civil Society and Community Involvement

To effectively help the city government address disaster risks and emergency situations, it needs the participation and assistance of each member of the community. The people of Olongapo city in general are considered by the DMO as its first line of defence against disasters. This is the very reason why the DMO focuses its diligent efforts in the IEC in the communities or barangays. Through this endeavour, the CDCC is able to engage the civil society and the population, arming them with the necessary awareness to prepare and protect themselves and their properties in the event of disasters.

Students in the city participate in school earthquake drills in schools and building evacuation exercises. Community-wide simulated evacuation exercises are also conducted to test the readiness of the locals in the event that disasters such as flash floods occur.

Active engagement of the city constituents was also seen in the gathering of information for the community-based monitoring system which is integrated into the disaster profiling of the CDCC/DMO.

The DMO also ensures that the community or barangay leaders and disaster managers are knowledgeable about the Community-Based Disaster Management system. They are equipped with the how-to's of contingency planning for disasters, hazard mapping and incident command systems.

7. Role of Media

The city government of Olongapo gives significance to the role of media as being instrumental in effectively creating awareness and response alertness among its constituents.

- *Mobile TV*
  Originating from mayor Gordon's barker approach, this modernized medium goes to the communities for announcements. According to mayor Gordon, this approach is bringing forced information to the people. He said, "Whether people like it or not, they have no choice but to listen to it no matter how annoying it is. Still, we are able to get the people's attention. It is annoying but they remember."

- *The Guardian*
  The Guardian is the official publication of the CDCC. It has continuously been released on a quarterly basis to educate the public on issues relative to disaster preparedness and update them as well on the programs of the CDCC.

- *Local channel/radio programs*
  Continuous coordination with local television and radio programs have helped generate public awareness among the city constituents as well.

- *Website*
  The DMO also taps the accessibility of the Internet by creating its own website, http://www.olongapocitydmo.webng.com.

8. Input from International, National and Local Experts

Inputs from experts, both local and international ones, are mainly in the form of skills trainings, evaluation and donations.

The Olongapo CDCC participated in the ASEAN Regional Forum Voluntary Demonstration of Response (ARF-VDR) in 2009, jointly sponsored by the United States and the Philippine governments. The exercises were geared towards further enhancing the cooperation in humanitarian assistance and disaster relief among neighboring countries following an occurrence of a major disaster. The ARF is a regional organization composed of members countries from the European Union, Southeast Asia, the Asia-Pacific and such countries as Australia, Russian Federation, New Zealand and the United States.

The ASEAN Committee on Disaster Management (ACDM) also shared its expertise on operational procedures for typhoons and chemical plant explosions. The CDCC was invited as one of the observers in the ACDM's simulation exercises in 2008, which contributed to the refinement of DMO's operational procedures and the enhancement of networking with other emergency response groups and specialists, given such scenarios. Apart from observing the exercise, the CDCC representative also participated in a workshop on camp management.

The Swedish National Red Cross shared its technological know-how on water sanitation for the event that disaster strikes and water is not easily accessible. In 2008, the CDCC/DMO participated in a Water Sanitation Plant Training conducted by the Swedish National Red Cross in Iloilo. The water sanitation process was demonstrated by drawing water from a source, the treating stage, laboratory safety analysis and then distribution. The process requires water sanitation tanks and gas-driven pumps.

Rescue 3 International, the world's leader in swift water and flood rescue training and standards, provided one of CDCC/DMO's members an extensive training covering swift water and flashflood rescue skills adopting international operational and management standards. The training was sponsored by the Geneve SA Philippines, Inc., a distributor of rubber boats in the Philippines.

The Swiss Volunteer Fire Brigades also conducted a fire-fighting tools familiarization training for the members of the Olongapo Urban Search and Rescue Team, Bureau of Fire Protection, and barangay volunteer fire-rescue brigades. This was in connection with the donation of firefighting tools and equipment by the Volunteer Firefighters of Vernier, Geneva and Switzerland.

In the local scenario, the Office of Civil Defense (OCD) under the Department of National Defense (DND) contributes to the improvement of CDCC's competencies. One of the OCD's functions is to develop and coordinate programs for informing, educating and training members of disaster coordinating councils and disaster control groups on civil defense and civil assistance measures. The training division of OCD provides the CDCC with management capability trainings and workshops such as the following:

- Rapid Damage Assessment and Needs Analysis (RDANA). This involves creating a scenario where difficult policy questions are posed causing potential conflicts regarding information-sharing and response policies of different jurisdictions and disciplines in anticipation of real world events.

- Hazards Mapping and Assessment for Effective Community-Based Disaster Risk Management (READY).

Other than with the Office of Civil Defence, the Olongapo CDCC works in close coordination with the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) for hydro-met hazards, and the Mines and Geosciences Bureau (MGB) for its geo-hazard assessment activities.

In terms of response, the CDCC undergoes the Program for the Enhancement of Emergency Responders (PEER). This was launched in 1998 by the United States Agency for International Development – Office of Foreign Disaster Assistance (USAID/OFDA) in partnership with the Asian Disaster Preparedness Center (ADPC) to help strengthen disaster preparedness and response capacities in Asia. It is a regional training program whose objective it is to reduce mortality rates during mass casualty events and increase survival rates of disaster victims. This program is funded by different international agencies. To date, they are targeting to cascade the PEER to the community level.

9. Sequence of Activities and Vertical and Horizontal Coordination

The four interrelated phases of disaster management, i.e.: mitigation, preparedness, response, rehabilitation - consist of vertical coordination among government disaster-related agencies and horizontal coordination across local government offices and with both public and private organizations. The illustration below summarizes the vertical and horizontal interdependency of various stakeholders in disaster management.

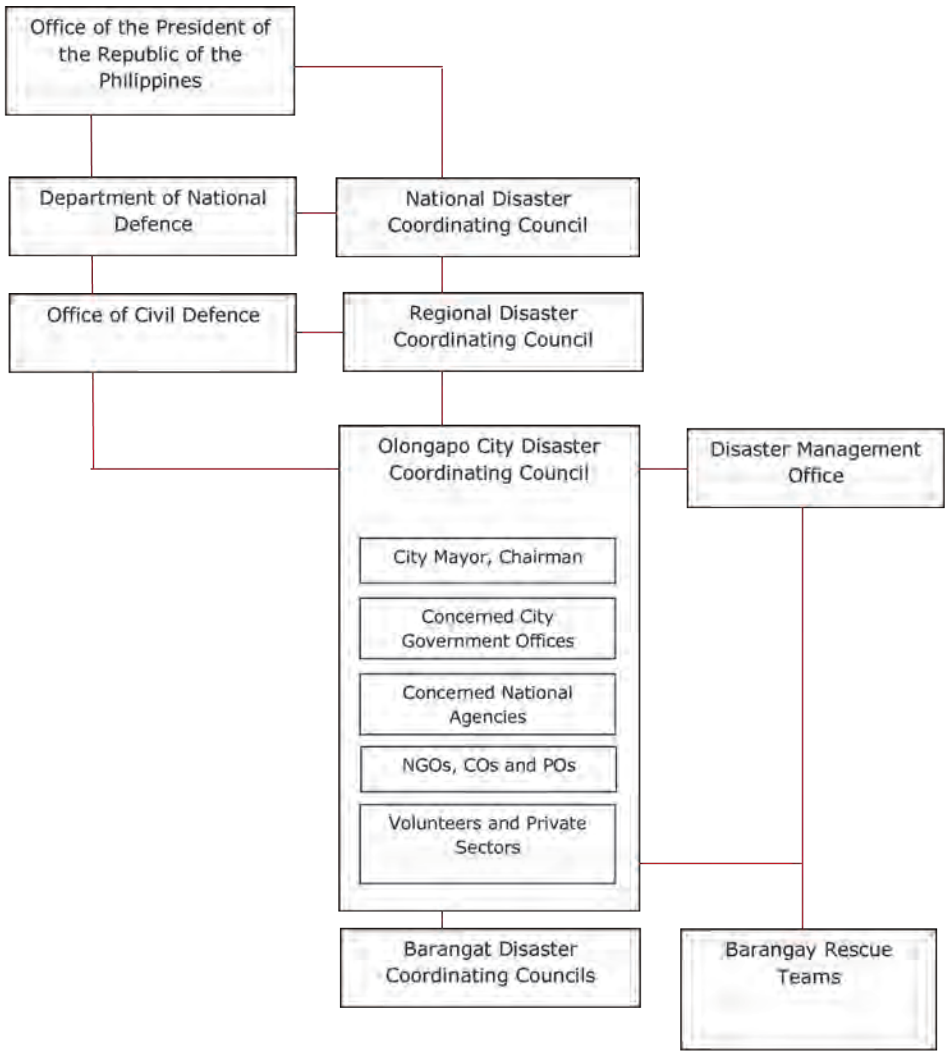

Figure 6: Vertical and Horizontal Interdependency of DMO Stakeholders

Section C. Evaluation of The Best Practice Model

1. Sustainability of The Model

The Olongapo CDCC is not discounting the fact that over the next fifty years, the world will face an almost unimaginable scale of various disaster impacts and that public leaders of the future will be living in a far more challenging environment. These challenges require leaders and managers who are well versed in critical thinking and in devising valuable systems to make intelligent decisions. Nevertheless, Olongapo city remains steadfast in addressing these challenges.

The sustainability of the CDCC/DMO depends on several factors, including:

- **Army of committed, educated, and skilled decision makers who are attuned to problems related to disaster management**
  The Olongapo CDCC is described to have high level of commitment, strong determination, response capability and cohesive effort. If these attitudes are sustained, then it is more likely that the CDCC's disaster management efforts can be continued in the long run.

- **Educated citizens to prepare for and to respond to these changing conditions**
  To sustain the model, there should be consistent efforts to maintain the participation of the citizens who are also the end-beneficiaries of Olongapo city's disaster management programs. This can be done through a continuous and thorough information and education campaign. The mayor said, "we have to maintain the skills. We are happy we beat another city in disaster management, which is a goliath. Other cities may have the funding and yet we beat them in community involvement."

- **Effectively sustaining the present disaster risk management activities**
  The CDCC/DMO has developed its emergency response plans and disaster management activities targeted to address the needs of the city. This has to be sustained, updated and customized according to the needs of the people of Olongapo. Vice mayor Cajudo relates, "We have come a long way from what we had before up to this time. Our experiences have developed us to be more aware and ready for future challenges of the city, even outside the city of Olongapo. The DMO team has been brought to Singapore and they have presented our activities and the readiness of the city of Olongapo in times of disasters. But that has to be two way process, we share our activities and we also learn."

- **Investment in human development and research**
  It is worthwhile to also consider the importance of scientifically updating the capabilities of the CDCC/DMO personnel, for example through trainings, as disaster-related concerns change over time. Similar to trainings, research on relevant disaster management activities that would benefit the locality should also be taken into account.

  According to Olongapo city Social Welfare and Development Officer Gene Eclarino, "The city government is investing in human development. For how will you manage if your human resources are not trained and knowledgeable to do their jobs?"

- **Sustained partnerships of multi-stakeholders**
  The sustainability of this program also depends on the partnerships among various stakeholders. Vice mayor Cajudo remarked, "We need committed assistance from various departments and agencies – government or private."

  DMO Chief Layug said that each of the stakeholders play vital roles in disaster management. For example, for response-related activities, the radio group is most reliable because the DMO is able to coordinate response easily.

- **Financial and equipment support**
  To sustain operations and efficiently carry out response activities, necessary financial resources, equipment and support facilities should be available. Olongapo city is very fortunate to have received donated equipment and facilities from various agencies and support groups.

- **Development of an effective monitoring and evaluation tool**
  In order to sustain the implementation of relevant activities and programs of any disaster coordinating council, it should devise an effective monitoring and evaluation tool for its performance.

- **Sustained political support and thrusts**
  Mayor Gordon believes that political will greatly affects the continuity of the city's disaster management programs. He said, "It depends on the mayor. My passion is about 101% percent [for disaster management]. If mayors will have that passion then they will be able to do almost anything." His leadership has earned CDCC various donated equipment and apparatus like fire suits, helmets breathing apparatus, generator, specialized foams, etc.

Moreover, sustainability should win over varying political directions as these might affect its institution. “It also depends on the leadership. You may have the best disaster management team and then if somebody takes over without the interest, it will just disintegrate. I put my heart and mind into it giving more support and looking for other equipment which we can afford,” adds the mayor.

2. Major Success Factors of Olongapo’s Best Practice Model

Twenty years after the Twin Mega Disasters of 1990s, Olongapo city has reached a level of progress, peace and serenity. Some would regard it as a miracle, but for the people of Olongapo city, it is simply because of the firm resolve to go out of a constraining zone and explore the opportunities, which came from disasters.

It is no wonder that Olongapo city is a multi-awarded city not only in the aspect of disaster management. Its most significant success factor in reaping commendations and recognitions, among others, would be the spirit of volunteerism – from the city leaders down to the citizens themselves. This was the same spirit of volunteerism, perhaps today even more intensified, that saved the city from languishing in economic and physical misery caused by the Twin Disasters of the 1990s. The CDCC/DMO was institutionalized to serve the people of Olongapo city, yet the people are also one of the key factors in its success. There is a visible volunteer movement among most people in the city. Time and again, the commitment of the people in supporting the advocacies of the CDCC/DMO is already an achievement in itself.

Another factor which led to the success of the CDCC/DMO is the progressive leadership in the city. Olongapo city was able to put in place effective disaster management systems with the common good of its constituents in mind. The CDCC/DMO earned the significant political, financial and administrative support from the city government, with special reference to the city mayor’s office. Furthermore, even with the awards and prestige already given to the Olongapo CDCC, the local government encourages it to continue to strive for more improvement and to aspire for excellence in terms of disaster management.

The CDCC/DMO used its extensive contacts within the local government as well as the private sector to promote and implement its programs and activities. According to the City Social Welfare and Development (CSWD) Officer Gene Eclarino, “It plays a big part that there is a good working relationship. Partnership is really necessary. All key departments have roles. The DMO is on top of the situation, with different committees as stipulated in the Emergency Response Plan.”

The contributions of several groups in terms of equipment support cannot be overlooked. Without these donations, it is unlikely that the CDCC/DMO would have functioned as efficient and as quickly. In the long run, the CDCC is confident to sustain its disaster management operations because of its state of the art equipment and facilities.

3. Major Challenges and Obstacles of Olongapo's Best Practice Model

As most organizations experience when introducing and integrating new practices in a system for its further improvement or development, the Olongapo CDCC/DMO experienced growing pains including:

- **Resistance**
  The information and education campaign of the CDCC is hard work under any circumstances, but it has been conducted under the constraint that some residents actively do not want to cooperate, and do not want to see the significance of the CDCC's efforts. Because of this, however, the CDCC feels it is even more of a challenge to continue its initiatives, as it believes it is for the general good of the city's population.

- **Disorganized community**
  Initially, Olongapo city was faced with the challenge of organizing its community to work together for a common goal – aiming for excellence. Organizing Olongapo city started with the late mayor James L. Gordon who converted Olongapo city from a reservation into a town then into a city that it is now. When he was killed, his wife, Amelia Gordon, became mayor. When mayor Amelia Gordon took over, she developed the master plan for the city, which was later improved and organized by her son who also became mayor, Richard Gordon. Richard Gordon organized his constituents – from public utility vehicle driver to street sweepers. Olongapo city has overcome the challenge of organizing the city. As a result, it is easier to call for their involvement during meetings.

- **Financial constraints**
  The DMO did not earn the approval of the DBM in elevating it to an independent department of the city government. Hence, it has to find other means to support its operations and the capacity building programs for its personnel. It was the common goal of the CDCC members, a resolute decision to establish the DMO, which helped them address the issue. An allocated 5% of the local calamity fund is being used to cover the expenses of the DMO.

- **Acquisition of facilities and equipment**
  During the initial phase of forming the core emergency response group of the DMO, they had difficulties in implementing disaster-fighting activities because of limited resources. But determined to pursue and improve on the city's disaster management programs, the incumbent mayor continued to form partnerships or dialogues with various agencies that are likely to contribute their resources in the form of facilities and equipment.

  An example would be Aviation Concepts, which is in the business line of aircrafts. The mayor was influential in having its expansion at the Subic Bay Freeport Zone. Mayor Gordon said Olongapo city could partner with this company specifically for airlifting patients from disaster areas and for a quicker transfer to a disaster-stricken area with an airport.

- **Terrain**
  Another big challenge is the terrain of Olongapo city. Only about 12% of the city area is inhabited by the city's population, packed tightly in one location. It is difficult to penetrate the mountainous areas and make it convenient for living condition. Therefore, when disasters take place in the dense area of Olongapo city, the impact is concentrated and affects the citizens badly. To address this, the incumbent city mayor is planning to search for new settlements. From there, road networks will be mapped out to satellite settlements into the valleys of the mountains, where another community could be created. The mayor said that proper zoning is a key solution, so that those living in disaster or landslide prone areas can be relocated to a safer place.

4. Why This Model is Viewed as Best Practice

One reason why the mayor considers Olongapo city's disaster management system as best practice is because it calls for active community participation. Disaster management activities cascaded down to the grassroots level have benefited the communities in the sense that they are given a feeling of security. The ultimate outputs of the CDCCs programs are productive and effective activities that enable the communities to help themselves, in their own capacity.

Moreover, helping others is generally a best practice. The mayor said, "I think people feel good when they help others. We feel good not only when we are able to help but when we are also appreciated. We understand from our experience. We are also happy if we are able to help other provinces."

The disaster management practices of CDCC/DMO are considered best because they satisfactorily fulfilled, and continues to fulfil, the objectives the office has set. Apart from the initial shortfalls and constraints, which they were able to address and overcome, it is believed that the Olongapo CDCC/DMO is now in a better position to effectively respond to any natural or man-made disaster.

5. Olongapo's Best Practice Transfer And Replications Adaptability

The Olongapo city's disaster management programs can definitely be replicated since disasters do not favor any nationality, age, religious belief, social status or political alliance. When a disaster strikes, its damaging impact affects everyone living in that area, as well as its neighboring regions and other localities who are dependent on that area as a major economic source.

If determined, any LGU can establish a disaster management office with such a high level of services as Olongapo city's. A replicating LGU should strive to reach the common goal of achieving zero casualties during disasters and ensure that stakeholders execute their functions in keeping with the action plan. The model has a simple composition of stakeholders, and the interdependency of roles would be successful if the functions are responsibly carried out.

Moreover, nerve response units of a replicated disaster management office should be appropriate and competent to brave a number of challenges in the advent of disasters.

However, the competencies, tools and resources available are limited to the general disaster risk situation of the Philippines. For example, mayor Gordon coined a 'relief operations – Philippine style' in responding to calamity-stricken provinces with relief goods already in hand. The CDCC operations may pose as good models but may also lack specific examples of how these strategies can be tailor-made in other municipal or local government units, especially in foreign countries. The challenge of replicating the programs of Olongapo CDCC lies in developing emergency response plans and disaster management activities targeted to address the needs of respective LGUs.

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