FINAL REPORT
CSG/SEI ENVIRONMENTAL PARTNERSHIP GRANTS -2005
Thematic Workshop on Clean Land/Grantee – State of Maryland

October 20, 2006

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Project name/state: **Thematic Workshop on Clean Land/Grantee – State of Maryland**

Project contact: **Henry Ahn**

Date: **October 20, 2006**

1. Project Background

The proposed project under the Council of State Governments (CSG) – State Environmental Initiative (SEI) Environmental Partnership grant is designed to support international, public-private partnerships that should facilitate environmental improvements. It is intended to provide specific support to the ongoing efforts of the Association of South East Asian Nations (ASEAN) to promote clean land management practices among cities in Southeast Asia. The ten member countries of ASEAN have a combined population of over 500 million and include some of the fastest growing metropolitan areas in the world. The recent devastation in many of these countries caused by the Tsunami on January 26, 2005 has totally demolished many facilities supporting clean land initiative and rendered a major blow to the growing infrastructure for the clean land initiative in these countries.

The goals and objectives of the proposed workshop are summarized in the following paragraph.

A. Project Goals & Objectives:

- To achieve minimal land disposal of waste and move towards sustainable production and consumption patterns
- To manage the effective disposal of solid waste, industrial waste and toxic wastes to safeguard public health
- To reduce the volume of waste generated and disposed
- To promote the development of waste minimization technology
- To develop and safeguard green areas in cities, and
- To enhance environmental responsibility and ownership

A series of thematic workshops were initially scheduled to be held in Singapore/Jakarta on clean land, clean water and clean air. These workshops were planned to assist national environmental leaders and municipal officials from 23 participating ASEAN cities develop municipal master plans and action programs to implement ASEAN's Framework for Environmentally Sustainable Cities. The list of cities to implement the framework on environmentally sustainable cities in ASEAN is shown in Table 1 below. With the help of the ASEAN secretariat for USAID/ CSG Partnership the two city partners selected for the Maryland clean land 2005 project are -

1. **Iloilo City,** Philippines and
2. **Balikpapan**, Indonesia

The **objectives** of the ASEAN framework for clean land seek to achieve:

(1) A solid waste management and disposal system that safeguards public health
(2) A toxic and hazardous waste management, minimization and disposal system to safeguard public health
(3) Reduction in waste generation and disposal
(4) Green spaces in cities
(5) Enhanced public environmental responsibility and ownership for waste minimization and recycling.
(6) Public/private partnerships to build capacity for waste minimization and recycling

Table 1 Cities To Implement The Framework On Environmentally Sustainable Cities In ASEAN

COUNTRY	**CITY**
Brunei Darussalam*	• Bandar Seri Begawan
Cambodia	• Phnom Penh • Siem Reap
Indonesia	• Balikpapan • Medan • Sidoarjo
Lao PDR	• Luang Prabang • Vientiane • Xayabouri
Malaysia*	• Putrajaya
Myanmar*	• Mandalay* • Yangon*
Philippines	• Cargayan de Oro • Quezon • Iloilo
Singapore*	• Singapore
Thailand	• Bangkok • Chiang Mai • Krabi • Phuket
Viet Nam	• Da Nang • Ha Long • Ha Noi
TOTAL 10	**23**

* Note: Burma (Myanmar), Brunei, Malaysia, and Singapore are not eligible for USAID assistance. As a result, participants from these countries will not be included in program activities.

2. Project Focus

The two city partners selected for the Maryland clean land 2005 project are -

1. **Iloilo City,** Philippines and
2. **Balikpapan**, Indonesia

The Clean Land Project is lead by S & M Engineering Services (SNM), Crofton, Maryland with active participation of eleven Team Members / Expert Panel. This project was conducted by a well-balanced team of professionals from various Industries, Academia, and Governments.

The Expert Panel includes -

Mr. Subijoy Dutta, P.E, (Tech. Director, S & M Engineering Services, MD) Team Lead,
Dr. William Roper, P.E. (Professor, George Mason University, VA), Associate Team Leader,
Dr. Phillip A. Singerman (Executive Director, Maryland TEDCO), Moderator/Facilitator, Mr. David Nemazie [Univ. of MD, Center for Environmental Science (UMCES), MD],
Dr. P. Somasundaran (Professor and Director, National Science Foundation I/UCR Center for Advanced Studies in Novel Surfactants, Columbia University, NY)
Dr. Darrell Cornell (Project Manager, MERCO, Inc., Denver, CO)
Dr. Waqi Alam (President, Tetrahedron, Inc., Baltimore, MD)
Mr. Gary Huffman (Chief Technical Officer and Member, Board of Directors, Enviro Products International, LLC, CO)
Dr. Matthew Perry (Senior Scientist, Patuxent Wildlife Research Center, MD)
Ms. Bonnie Robinson (Geologist, Yamuna Foundation for Blue Water, Inc., MD)
Dr. Raj Rajaram, P.E., J.D. (Independent Consultant, Oak Brook, IL)

The initial project focus was anchored to the thematic workshop on clean land in Jakarta, Indonesia, June 15-16, 2005.

To get this project a head start a planning meeting was arranged at the Patuxent Wildlife Visitor Center in Maryland on May 20, 2005. Because of the indefinite postponement of the workshop in Jakarta by the ASEAN secretariat, the selection of ASEAN city partners were disassociated from the thematic workshops after a discussion with CSG. During a meeting of the ASEAN Working Group on Environmentally Sustainable Cities (AWGESC) thereafter in Ha Noi, Vietnam, the ASEAN secretariat determined a method to pick the city partners by an application process from the interested ASEAN city partners for all three areas - Clean Land (MD), Clean Water (NH), and Clean Air (OR).

Out of the nine cities included in the application the following four cities were then suggested by Maryland as potential project partners – Phuket City, Thailand; Iloilo City, Philippines; Chiang Mai, Bangkok; and Balikpapan, Indonesia. Amongst these four cities further screening was done in discussion with CSG/SEI and finally on September 2, 2005, the two cities - **Iloilo City**,

Philippines, and **Balikpapan**, Indonesia were chosen to begin the Clean Land 2005 project. The original project goals and objectives were always in focus during the selection process by the SNM team.

3. Project Status and Assessment

The project schedule got slightly changed due to the disassociation from the thematic workshop-based original approach. A chronology of project steps and accomplishment are furnished below under Table 2.

Table 2. Complete Chronology of Clean Land 2005 Project from Start to End

April 2005	A head start on the Project was initiated by a visit to the ASEAN Environmental Partnership in Singapore during April 5-6, 2005 by Subijoy Dutta, Project Director for the SNM Team of the Maryland Partnership.
May 2005	A Planning Meeting was conducted at the Patuxent Wildlife Visitor Center on May 20, 2005. A productive planning and discussion was conducted with active participation of the members.
June 2005	Subijoy Dutta of the SNM Team had a meeting with the CSG HQs in DC concerning the upcoming changes
July 2005	An exploratory site visit to the prospective ASEAN cities in Thailand was made by Subijoy Dutta, P.E. and Dr. Waqi Alam of the SNM Team during July 22 to August 1, 2005. A few presentations on waste minimization and recycling were made at the Environmental Engineering Department at the Asian Institute of Technology (AIT), Environmental Department at the Chiang Mai University, Chiang Mai, and the Waste Management Division of the Chiang Mai Municipality. A 25-page hand out on waste minimization and recycling was also provided to the attendees. Considerable interest was expressed by AIT in conducting further outreach activity. The Chiang Mai Municipality expressed interest in getting a model solid waste management facility started there. A site visit to an old landfill area in Chiang Mai was arranged by the Municipality on July 30, 2005.
August 2005	Two ASEAN City partners were identified an selected for the Clean land 2005 Project.
September 2005	Phase I Report submitted to CSG for the Clean Land 2005
October 2005	Began Dialogue with the ASEAN city partners
November 2005	Developing a model Solid Waste Management plan for Iloilo City, Philippines and initial information exchange with Balikpapan, Indonesia.
December 2005	Feasibility determination of model solid waste management plan by Iloilo city partner. Initial GPS based mapping of Balikpapan
January 2006	Teleconferencing with ASEAN city partners and discussing project plans
February 2006	Developing options for Household Hazardous Waste Collection and Disposal - Iloilo City and Developing strategic solid waste management

Table 2. Complete Chronology of Clean Land 2005 Project from Start to End

	plan for Balikpapan, Indonesia.
March 2006	Visit to Iloilo city, Philippines, and Balikpapan, Indonesia by the Maryland team (William Roper and Subijoy Dutta)
April 2006	Analyzing site data and developing plans for Iloilo city, Philippines and Balikpapan, Indonesia.
May 2006	Preparation of Draft plan for the City partners
June 2006	Reverse Exchange – visit to US (Maryland, Delaware, and New York) by the Iloilo City partner. Conducting an Exchange Workshop on June 30, 2006 with a number of technical experts and Project team members and partners.
July 2006	Developing final Plans for Iloilo City, Philippines and Balikpapan, Indonesia.
August 2006	Maryland team (Gary Huffman) visits Iloilo City to conduct a training and workshop for both the city partners, Balikpapan, Indonesia, and Iloilo City, Philippines from August 14-19, 2006. The following major goals were accomplished: **Iloilo City, Philipines -** ✓ Three pilot household hazardous waste collection centers got started according to the plans developed by the Maryland team. ✓ The medical waste management plan developed by the Maryland team got initiated by waste segregation at two Hospitals in Iloilo City. The stakeholder Focus group formed to implement the full plan is working on developing an effective plan for the Hospital and Nursing home/Clinic consortium in Iloilo city, Philippines.
September 2006	**Balikpapan, Indonesia** – ✓ The strategic plan for waste disposal developed for Balikpapan was revised by the Balikpapan city partner to suit their needs and the finalized plan has been reviewed and sent back to the Balikpapan City partner with comments. ✓ As per the site visit by the Maryland team in March 2006, site selection criteria for permanent solid waste disposal facility were provided to the Balikpapan city partner. A final selection of the landfill site was made by the Balikpapan city partner in accordance with these site selection criteria.
October 2006	Final Report submitted to CSG

List of deliverables

The following documents were submitted/delivered, including this Final report in compliance with the approved design, goals and budgets:

1. Monthly updates
2. Financial reports

3. Phase I Report September 2005
4. Project summary as an article for inclusion in CSG newsletters:
    - Clean Land 2005 – One-pager for USAID Feb. 2006
    - "Ecos", June 2006
5. Final Report

In addition to the above, one planning meeting (May 2005) and an Exchange Workshop (June 2006) were arranged and meeting summaries have been submitted along with monthly reports to CSG.

Summary of Benefits to the ASEAN City Partners

The list below provides some of the highlights of the Clean Land 2005 project in terms of the direct benefits provided by the project to the ASEAN City partners. In addition, there are a number of ancillary benefits imparted by the project through the training, stakeholder involvement, partnerships, and exchanges involved during the conduct of the project.

Benefits to the ASEAN City Partners

- Provided a conceptual solid waste management and disposal system that safeguards public health.
- The handouts and literature provided to both Iloilo City, Philippines, and Balikpapan, Indonesia reflect the partnership effort by providing the tools needed for proper management of hazardous and solid waste
- Three pilot household hazardous waste collection centers got started in Iloilo City, Philippines according to the plans developed by the Maryland team.
- The medical waste management plan developed by the Maryland team got initiated by waste segregation at two Hospitals in Iloilo City. The stakeholder Focus group formed to implement the full plan is working on developing an effective plan for the Hospital and Nursing home/Clinic consortium in Iloilo city, Philippines.
- The Balikpapan City partner has moved the mounting trash pile next to the incinerator at the present landfill to a distant area and rearranged the placement of trash with a milder slope to reduce the threat of a landslide as identified during a visit in March 2006 by the Maryland team.
- The strategic plan for waste disposal developed for Balikpapan was revised by the Balikpapan city partner to suit their needs and the finalized plan has been reviewed and sent back to the Balikpapan City partner with comments.
- As per the site visit by the Maryland team in March 2006, site selection criteria for permanent solid waste disposal facility were provided to the Balikpapan city partner. A final selection of the landfill site was made by the Balikpapan city partner in accordance with these site selection criteria.
- The project partnerships have been an advocate of public/private partnerships to build capacity for waste minimization and recycling.

Partners – roles and responsibilities

1. The State of Maryland - Maryland Technology Development Corporation (TEDCO) has participated in the project administration; reviewing project modifications, monitoring progress, and helping establish the administrative procedures.

2. S & M Engineering Services – SNM played the major role in the project design and in developing site-specific plans for implementation by the project partners. Major coordination work was conducted by SNM for proper communication with the ASEAN city partners. SNM's Asia office in Kolkata, India played an important role during the project in printing and mailing documents from the office in Birati, Kolkata periodically. Also, some communication assistance with Indonesia and Philippines city partners were provided by the Kolkata Office of SNM. During the initial site selection process for ASEAN city partners S & M Engineering explored a number of options to meet the project objective by visiting a few ASEAN cities and providing them with information on Pollution Prevention (P2). After the selection of two ASEAN city partners, the process of identifying specific problems and tasks for the project took some effort but were well accomplished due to a great teamwork of the Maryland team and great cooperation, and support of the City partners. All monthly reports, Phase I report and the Final report and other deliverables have been prepared by SNM. Complete analyses of all site data, including GPS and GIS mapping have also been completed by SNM. This project has really made a difference by paving a path for the two city partners to step forward in an unified manner with all of the stakeholders providing valuable and timely input in the their waste management decisions. This approach could possibly be used in other countries to provide a meaningful assistance towards improvement of health and environment for the common people.

3. Univ. of MD Center for Environment and Science (UMCES) (www.umces.edu) – Dave Nemazie, our partner team member from UMCES in Cambridge, MD has attended the planning meeting and the exchange workshop for this project. He has also hosted a site visit during the reverse exchange visit where our Iloilo city partners got an opportunity to see some of the field projects involving watershed protection and learn those methodologies for application in Philippines.

4. Patuxent Wildlife Research Center – Dr. Matt Perry, Research Biologist at the Patuxent wildlife research center (www.pwrc.usgs.gov/) provided support and input during the planning workshop and other discussion on the project.

5. George Mason University (www.gmu.edu) : Dr. William E. Roper, P.E., provided a very strong support in conducting the project including active support in the two workshops and coordinating a site visit during the reverse exchange. Dr. Roper has interest in solid & municipal waste. He worked as a Senior Executive Service (SES) in US Army Corpse of Engineers. His other interests include: Geospatial/Remote Sensing as well as data analysis. As a Maryland team member Dr. Roper visited Iloilo City, Philippines and Balikpapan, Indonesia and provided active technical support in the project.

6. MERCO, Inc. in Denver Colorado – Dr. Darrell Cornell, Project Manager at Merco, Inc. provided a great support by developing the Pollution Prevention (P2) guide for the clean land 2005 project. He joined by teleconferencing in the planning workshop and provided a great support to the MD team by developing a useful document for the ASEAN city partners on Recycling, composting and Pollution Prevention (P2).

7. EnviroProducts International (EPI), LLC – Gary Huffman, Executive Vice President and Chief Technical Officer of EPI played an active role in the project. EPI's mission is to develop "Green" building products that can reduce the amount of waste land filled through inclusion of that waste in high quality concrete products. They try to include as much non-toxic waste material as possible without sacrificing quality. During the exchange workshop Gary Huffman provided a presentation on the possibility of converting municipal solid waste to "Green" cementitious products such as bricks or building blocks which could be used for common construction purposes. Later, Gary Huffman went to Iloilo city, Philippines in August where he had visited some of the sites and looked at the feasibility of a demonstration scale project in collaboration with Iloilo city. He also carried out a number of important tasks for the Maryland team by providing training to the Iloilo City and Balikpapan City partners on Solid, Hazardous, and Medical waste management.

8. Tetrahedron, Inc – Dr. Waqi Alam, a Maryland team member provided great input during the project by collaborating a site visit for the reverse exchange team. Dr. Alam also visited a few ASEAN cities along with Subijoy Dutta during the exploratory visit in July 2005. Tetrahedron, Inc. specializes in ISO 14000 environmental quality assurance training. Our city partner, Iloilo city has expressed interest to use Tetrahedron's services to get the local Oil companies in Iloilo city to get ISO 1400 certified. This certification will ensure better and safer environmental management of wastes for these companies and would benfit Iloilo city.

9. Columbia University (www.columbia.edu) : Dr. P. Somasundaran, a renowned professor and Chair of Dept. of Chemical Engineering, Material Science & Mineral Engineering at Columbia University. He has provided a great support in the project by hosting a site visit to the COVANTA ESSEX Waste to Energy Facilities, 183 Raymond Blvd., Newark, New Jersey, on June 28, 2006. Mr. Noel Hechanova our Iloilo city partner wrote that he had learnt a number of things by visiting this facility. One of the most important things that struck Mr. Hechanova was that thermal treatment/Incineration of waste to convert them into energy was quite a safe and environmentally sound method used at that site. Since Incineration is banned in Philippines this field visit provided him with the evidence that there could be safe method of thermal conversion of waste to energy. Hosts at the facility: Steven Bosssotti - VP, Richard Giordano-Facility Manager, Hank Asher - Business Manager, George Kimiecik - Environmental Engr., Kenneth Armellino - Regional Environmental Manager. Dr. Somasundaran coordinated the visit and drove to the facility with Noel Hechanova.

10. Iloilo City, Philippines – Mr. Noel Hechanova, Chief, City Environmental and Natural Resources Office (ENRO), Iloilo

City, Philippines provided great cooperation and support in the project. The details of their cooperative effort are provided in the report under project activities for Phase II.

11. Balikpapan, Indonesia – Ms. Lilis Marwiani, Head of Analysis & Evaluation Sub Section, Environmental Impact Management Agency (Bapedalda) in Balikpapan was our primary contact for Balikpapan, Indonesia. Ms. Marwiani provided valuable suggestions during the initial phase of the project and her organization and arrangement during the site visit by the Maryland team was laudable. The details of their cooperative effort are provided in the report under project activities for Phase II.

3.1 Project Activities during Phase I

Summary Activities

Phase I report (MD TEDCO/SNM Engineering 2005) submitted in September 2005 covered all of the project activities until August 2005. A summary of Phase I report is provided here for ready reference.

Meeting with ASEAN chairman in Singapore by SNM (April 5-6, 2005)

Subijoy Dutta met with the ASEAN Environmental Partnership in Singapore on April 5, 2005. Ms. Suat Hoon (65-6731-9646), Senior Scientific Officer, Planning and Development Department, The National Environment Agency (NEA), Singapore, set up a meeting. The following officials from the Singapore NEA were present at the meeting:

A. Mr. Loh Ah Tuan, Director General, Environmental Protection Div., NEA, Chairman, ASEAN Environmental Partnership, Ph: (65) 6731-9446, e-mail: loh_ah_tuan@nea.gov.sg
B. Mr. Joseph Hui Kim Sung, Head, Planning & Development Dept. NEA, Ph: (65) 6731 9619, e-mail: joseph_hui@nea.gov.sg
C. Ms. Soh Suat Hoon, Senior Scientific Officer (External Coop.), Planning & Development Department, NEA, Ph: (65) 6731-9646, e-mail: SOH_Suat_Hoon@nea.gov.sg

Mr. Loh Tuan opened the discussion with a very warm welcome. Mr. Tuan provided an excellent background and history behind the proposed Thematic workshops on Land, Air, and Water in Jakarta scheduled then for June 14-16, 2005.

Following the meeting SNM conducted some open literature search and studied the activities of the ASEAN environmental partnership. ASEAN has one of the richest and most varied natural environments in the world, and the judicious use of these resources plays a big part in the continued well being of its people. Along with the rich and varied resource mix comes the challenge of caring and nurturing. The status of the environment and natural resources in ASEAN member countries, including the socio-economic settings and the external pressures that impinge

on the environment has been well described in their annual report (ASEAN 2000 report), which can be accessed through their website: http://www.aseansec.org . While it falls upon national governments to take actions to address and manage environmental problems, ASEAN has long recognized the synergistic benefits in addressing common problems on a regional basis. This is becoming even more imperative as many environmental problems transcend not only national boundaries, but are increasingly becoming global and complex in nature. The ASEAN's environmental management framework has been explored by SNM after the discussion and all throughout the clean land 2005 project this framework was closely followed to ensure relevance and harmony in the project focus and objectives. We (SNM) have gathered enough insight from the above information which helped us throughout the project in our partnership efforts with Balikpapan, Indonesia, and Iloilo City, Philippines.

Planning & Development Workshop Patuxent Wildlife Research Center, Laurel, MD

To get this project a head start a planning meeting was arranged at the Patuxent Wildlife Visitor Center on May 20, 2005. Figure 1 shows some of the participants at this meeting. Several topics were discussed at this workshop. The pollution prevention initiative was covered in detail by Dr. Darrell Cornell via teleconference from Denver Colorado. The methodology for selection of ASEAN official for the reverse exchange was also discussed at length. SNM developed a multiple choice questionnaire which could possibly assist in selecting the ASEAN officials for reverse exchange. The multiple-choice questionnaire which could be scored by using a program based on the weight on different survey questions. This scoring process could effectively support the objective of the reverse exchange by USAID/CSG. This narrowed down list by the scoring process could be used by the ASEAN or USAID officials to finally select the few participants for the reverse exchange.

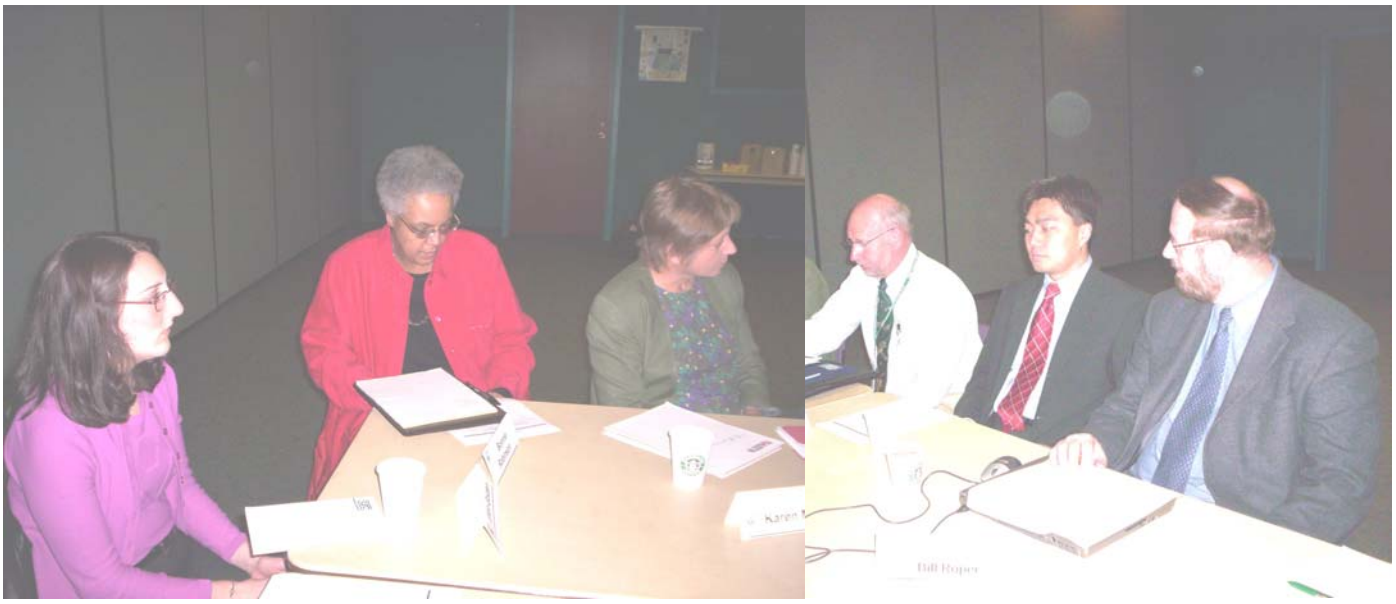

Figure 1. Some of the Participants at the Planning Meeting, May 20, 2005
(From L to R– Ellen Golden, Bonnie Robinson, Karen Marshall, Matt Perry, Henry Ahn, Bill Roper; Patuxent Wildlife Visitor Center, Laurel Maryland, Photo: S Dutta)

Research on Possible Use of GIS and Remote Sensing applications in spill/disaster and waste management

To assist in risk assessment to assure the safety of waste management facilities remote sensing methodologies integrated with GIS was found to be an area of rapid development which could be used in the clean land project effectively. This included specifically the use of remote sensing technologies to assist in the ongoing efforts of the Association of South East Asian Nations (ASEAN) to provide an effective means of managing their waste in a safe and protective manner. This was further researched and explored and a paper on *Remote Sensing and GIS Applications* (Roper and Dutta 2005) was accepted for presentation on July 27, 2005 at the ESRI 2005 User Conference in San Diego, California. The paper was published in the proceedings/CD of the 2005 ESRI International User Conference. The link below should provide access to the paper. http://gis.esri.com/library/userconf/proc05/abstracts/a1762.html

The paper addressed some of the applications of the remote sensing and GIS technologies to pipeline security assessments. The remote sensing methodologies described in this paper could support international environmental improvements in many countries. This includes specifically the use of remote sensing technologies to assist in the ongoing efforts of the Association of South East Asian Nations (ASEAN) to provide an effective means of waste and environmental hazards management during an emergency response in various cities in Southeast Asia. (Roper & Dutta 2005). The remote sensing systems described in this paper provide guidance for selection of the best approach to respond to various types of degraded environmental conditions due spills, disasters, or other activities.

Conference Call, June 24 – Options to De-link Thematic Workshop

A Conference call was arranged by CSG/SEI on June 24, 2005 to discuss options for de-linking the Clean Land, and other (Water, Air) initiatives from the Thematic Workshop, because of the uncertainty as to when the Workshop would take place.

Attendees:

Chris Whatley, Director of International Affairs, SEI Manager, (SEI)/Council of State Governments, (CSG) Washington, DC

Karen Marshall, Environmental Partnership Grants Coordinator SEI/CSG, Lexington, KY

Ellen Golden, State Environmental Initiative (SEI)/Council of State Governments, (CSG) Washington, DC

MARYLAND (CLEAN LAND)

Subijoy Dutta, Project Director, Clean Land 2005 S&M Engineering Services, Crofton, MD

NEW HAMPSHIRE (CLEAN WATER)

Gerry Crawford, Commercial Consul - Asia
State of New Hampshire
Ihab Farag Hamel Professor of Innovation & Technology
Chemical Engineering Department

OREGON (CLEAN AIR)

Glenn Montgomery, Sustainable Business Liaison
Oregon Economic and Community Development Dept
Linda A. George, Associate Professor
Center for Science Education/ESR

CSG (Ellen Golden) provided some information consisting of a list of cities with which each team would like to work, as well as the tentative program for the ASEAN Working Group on Environmentally Sustainable Cities (AWGESC) meeting in Hanoi, Vietnam and asked the US teams to explore possibilities of selecting suitable ASEAN city partners.

Accordingly the MD team prepared literature and materials on Pollution Prevention (P2) Initiative for providing those as an educational Material during the proposed visit to the ASEAN Cities in Thailand, planned for July 2005. Site visit by the US team to Chiang Mai, and Bangkok, (Thailand) were planned for July 2005 to share the P2 literature and relevant environmental technologies (Dutta 2002) with ASEAN officials and other potential project partners in support of the SEI project goal and objectives. An invitation was received from Dr. Ashim Dasgupta, professor at the Asian Institute of Technology (AIT) http://www.serd.ait.ac.th/eem/

Visit to Bagkok and Chiang Mai, Thailand and Discussion with Potential Project Partners and Site Visits

The S & M Engineering (SNM) team consisting of Subijoy Dutta, and Waqi Alam visited Bangkok, and Chiang Mai, Thailand in the 3rd week of July 2005.

The SNM team conducted a few sampling and analysis of the Chao Phraya River. Two critical sampling points for the river were determined by using GPS (Global positioning system). There was a noticeable increase in the conductivity (indicator parameters) of the water from the upstream to the downstream location. This increase in conductivity between the two sampling points is an indication of the increase in pollutant load in the river from the Bangkok area. A detail map of the area captured by GPS is shown in Figure 2 below. Results from the site sampling of the Chao Phraya river in Bangkok is summarized in Table 3 below.

Table 3. Sampling Results for the Chao Phraya River, Bangkok, Thailand, July 27, 2005.

Sampling Locations	Lat/Long GPS Readings	Temperature (Ambient)	Temperature (Water)	Conductivity	pH
Upstream (1)	14°-1'-31.4" N 100°-32'-24.9"E	34 C	32.5 C	290 µmho/cm	5.0 SU
Downstream (2)	13°-43'-3.1" N 100°-30'-45.0"E	33.5 C	30.0 C	395 µmho/cm	5.0 SU

Figure 2. Sampling locations 1 and 2 of the Chao Phraya River on a scaled map, captured by the Global Positioning System (GPS)

On July 28 a presentation was made by Subijoy Dutta at the ***School of Environment, Resources and Development (SERD), AIT*** and a question answer session was held following the presentation. One of the attendees was Samir K. Khanal, PhD., P.E. a visiting faculty from the Iowa State University, Department of civil, construction, and Environmental Engineering (Ph: 515-294-7089, e-mail: samirk@iastate.edu) who was working on a research project at AIT at the time of our visit. Figure 3a and 3b shows a couple pictures taken at this facility. The main contact information of the Environment Department is provided below:

Dr. Preeda Parkpian, Head of the Department
School of Environment, Resources and Development (SERD)
Asian Institute of Technology, P.O. Box 4, Klong Luang
*Pathumthani 12120, Thailand, Tel: (662) 524-6069,524-6072; Web:*http://www.serd.ait.ac.th/eem/

(a) (b)

Figure 3a Environmental Management Conference Room at AIT, Bangkok (Dr. Preeda Parkpian, Samir Khanal and Ashim dasgupta are see L to R, Photo: S. Dutta); Figure 3b shows Dr. Waqi Alam and Subijoy Dutta (L-R), the SNM team from US, in a building donated by US Govt. to the AIT (photo: Preeda Parkpian).

Distribution of Literature on Pollution Prevention (P2) Initiative – Presentation/Literature as an Educational Material during Visit to the ASEAN Cities

A 25-page Pollution Prevention Handout and a one-page flyer was developed. A number of copies of this paper were distributed to AIT, Bangkok, Chiang Mai University, Chiang Mai, and the Sanitary Engineering Division, Chiang Mai, for their dissemination to various organizations and communities.

Discussion and Presentations in Chiang Mai, Thailand

On July 28th a meeting was held with Dr. Suwasa Kantawanichkul, Associate Professor, Department of Environmental Engineering at the Chiang Mai University (CMU). Various partnership efforts were discussed which could be of interest to the CMU.

Next day a meeting was held with the Head of the Department, Mining Engineering at the Chiang Mai University where the impact of mining in the Lam Phang area was discussed.

A meeting was arranged by the Chang Mai Municipality in the afternoon. Mr. Vongkot Owatsakul, Engineer of the Sanitary Engineering Division, provided great coordination and support. Mr. Somsak Larpadisorn, Director of the Sanitary Engineering Division and Mr. Warawuth Tokanitchart, head of the wastewater program joined the discussion. Mr. Somsak Larpadisorn, in-charge of the solid waste, water, and air program of the Chiang Mai Municipality, and others are shown in Figure 4.

Figure 4. Chiang Mai Municipal Officials with Subijoy Dutta
(From L to R – Mr. Vongkot Owatsukul, Mr. Warawuth Tokanitchart, Mr. Subijoy Dutta, and Mr. Somsak Larpadisorn. Photo: W. Alam)

Next day (July 30, Saturday) Mr. Larpadisorn arranged for a visit to the Landfill site. A picture of the old Landfill site is shown on Figure 5.

Figure 5. Old abandoned Landfill, Chiang Mai Municipality (Photo: S. Dutta)

4. Specific project activities (Phase II)

According to the original plan developed at the beginning of the clean land 2005 project the following steps were developed and methodically pursued to meet the project objectives for the ASEAN cities. At the end of Phase I Steps 1 through 3 were completed (as shown faded below) and the MD team began Phase II with Step 4 as listed below:

Step 1: Planning meeting (May 20, 2005 in Maryland)
~~Step 2: Workshop in Jakarta~~ (Postponed indefinitely - no longer part of the project steps)
Step 2: Visits to a few ASEAN cities by the Maryland team - Waste minimization and Recycling outreach, data collection and exploring partnership possibilities – Completed in July 2005
Step 3: Selection of City partners - completed as detailed above
Step 4: Communication and Discussion with City Partners – to begin initial dialogue
Step 5: Data collection and Specific Project identification – November-December 2005
Step 6: Reverse Exchange with representatives from Iloilo City and Balikpapan (Dates TBD – will be determined after some feedback from the city partners)
Step 7: Return visit to provide field support back in ASEAN countries (Dates TBD - will be determined after some feedback from the city partners)
Step 8: Meeting in DC to discuss results and wrap up the Clean Land 2005 project.

As evident from the project chronology provided under Table 2 (p. 5), in addition to the all of the above steps few additional steps have been completed during Phase II of this project.

… in addition to the all of the above steps few additional steps have been completed during Phase II of this project.

4.1 Project Activities During Phase II

Detail Project Activities during **Phase II** with the Selected ASEAN City partners – Iloilo and Balikpapan are provided below:

Phase II project activities began from September 2005. Project activities beginning from that time till date is summarized below.

Summary Monthly Activities (September 2005):

*Conducting a Background Study on the City Partner, **Iloilo City**, Philippines.*

Iloilo is the capital city, regional center and one of the main economic hubs of Philippines. It is the Capital of Western Visayas, which is one of the twelve regions of the Philippines and is designated as Region VI. It consists of six provinces, namely, Aklan, Antique, Negros Occidental, Capiz, Guimaras and Iloilo. There are 17 cities in these six provinces which makes the Region the topmost in the total city count.

Originally known as "The Queen City in the South" for its natural deep water port at Port San Pedro, Iloilo was one of the major agricultural centers of the Philippines supporting export of sugar, copra, bananas, mangoes, and other natural resources during the Spanish Galleon, and later as an American colony. The list of Philippines provinces and their population, gathered from the National statistics office, Philippines was provided in the September 2005 monthly report.

The ongoing activities and issues identified in application by the city partner, Iloilo City, have been carefully studied. Relevant information from the available literature and publications were also obtained. The Philippines Clean Cities Project (CCP): promoting waste minimization through local Government, a clean production (CP) initiative for the 12 cities in Philippines provided a valuable insight into the waste generation and management history of major cities in Philippines, including the Iloilo City. According to the information from the paper by Burton Hamner[1] and Anthony SF Chiu[2] (Hamner and Chu 2003) Solid waste management is a major cost for Philippine cities. The Pacific Northwest Economic Region (PNWER) had partnered with the League of Cities of the Philippines (LCP) to demonstrate that local governments could successfully reduce resource use and waste generation in their own operations and in businesses and communities by applying the principles of Cleaner Production.

The mayors who met with PNWER estimated that they spend between 10 and 20 percent of their budgets on waste management. This estimate is supported by sources such as the World Bank, which estimates that the urban areas of Asia now spend about US$25 billion on solid waste management per year; this figure will increase to about US$47 billion in 2025 [Hoornweg, D. and L. Thomas, 1999].

The Clean Cities project was established to help a group of pilot cities learn about and implement CP practices with the objective of reducing waste management costs, improving efficiency and productivity, and creating social benefits from having cleaner and greener cities. Twelve cities decided to participate in the pilot project.

City Name	Population
1. Angeles City	300,000
2. Antipolo	1,300,000
3. Bais	68,000
4. Dagupan	130,000
5. Iloilo	363,000
6. La Carlota	56,000
7. Mandaue	300,000
8. Naga City	130,000
9. Island Garden City of Samal	83,000
10. San Fernando	102,000
11. Tagaytay	32,000
12. Toledo	130,000

[1] Lead author. President, CleanerProduction.com. bhamner@cleanerproduction.com
[2] Consultant, CDG EMCBP Project. ac@tri-isys.com

The importance of Cleaner Production to the cities can be estimated using the World Bank estimates described above. According to PNWER, the cost of solid waste management for an estimated 3 million people in the above12 cities was *conservatively* estimated at US$10.95 million per year as follows:

3,000,000 people
x 0.5 kg solid waste/day/per capita
= 1500 tons per day, or 547, 500 tons per year
= $10,950,000 per year @ $20/ton

Following the experience of Cleaner Production world wide, it is quite reasonable to expect that solid waste volumes could be reduced by at least 10% by promoting and implementing CP methods, not including new investment. Such a reduction could well save the twelve participating cities over a million dollars per year in total, counting only the avoided waste management costs. Since CP is based on improving efficiency and productivity, there would also be revenue gains from increased profitability and tax collection in the cities, and political benefits from this positive and non-regulatory approach. According to the CCP report the Iloilo City had achieved an 88% reduction in waste generation by the City Hall as a result of their participation in the CCP. A summary of information provided by the CCP initiative on Iloilo City is furnished below:

ILOILO CITY

Iloilo province is the jewel of the South Orient and the origin of the local Ilonggo's folk, wisdom, and tradition. Iloilo City reportedly has a lot to give for its people to see and appreciate. Iloilo is primarily an agricultural city. The supply of rice is not only limited to the region but is also distributed to various regions in the Philippines. Even then, Iloilo's economy possesses widespread reach in the commercial and industrial sectors. It is blessed with rich natural and aquatic resources, extending its market share both locally and internationally. Iloilo is known as a supplier of fish for Japan's canning industry.

Project Champions

City Mayor:
Hon. Jerry Treñas

Implementers / Partners

1. City Solid Waste Manager
2. City Environmental Management System Team

Conducting a Background Study on the City Partner, ***Balikpapan, Indonesia***

The municipality of Balikpapan has a total area of 750 square kilometers (km^2). The Balikpapan area is 85 percent mountainous and 15 percent flat. The municipality is located on the valley ridge and along the coastal line. Kariangau is a 17,532-ha subdistrict located in West Balikpapan district. Balikpapan Bay, in which the port of Balikpapan is located, extends north from the mouth of the Makassar Strait. It has a width of 5.6 km at the entrance, and some 20 km lies between the mouth of the bay and Balang Island. From its topography, the bay may be classified as semi-closed, which may be a retentive polluting zone. High tide is 1.40m above mean sea level (MSL), and the low tide is 1.40 m below MSL.

Balikpapan is the economic hub and gateway to Indonesia's richest province, East Kalimantan. Located one degree south of the equator, the city stretches along the northeastern shore of a large embayment and natural harbor. Balikpapan Bay has a surface area of about 15,000 ha within a compact total watershed area of 211,456 ha. Within the overall watershed are some 56 rivers and creeks. Much of the bay's shoreline
is still forested, with about 17,000 ha of mangroves forming a key habitat for fish and birds (USAID 2000).

Some of the basic information on Balikpapan is provided below:
Population ~ 500,000
Area : ~ 500 Sq.Km
City of forest
Oil and Gas Services

Moving along the same lines of the clean cities project (CCP) mentioned above for the Iloilo city, the following summary information on Balikpapan was obtained from the information provided by Lutfi Lesilolo, Indonesia coordinator for CCP, the International Council for Local Environmental Initiatives (ICLEI) (Lesilolo 2004).

Before adoption of the CCP initiative (2001)
Waste Collected : ± 200 ton/day (60 % total volume)
Services Organised by: Waste management office; Door to door (Residential)
Disposed at: Temporary Landfill (sub- district); Landfill (city boarder)
Operational Difficulties: Time consuming ; High cost

CCP Initiative – August 2002

- *MOU (between city and forum – August 2002)*
- *Mayor Leadership*
- *Trained city staff*
- *Awareness program*
- *Transportation (37 trucks)*
- *Community Involvement: Involved sub-districts (27), and residential communities by simplifying the collection management*

Result of CCP Initiative (2003-2004)

- *Waste collected : +/- 250 ton/day (25 % increase)*
- *Spared time to serve non- residential*
- *Increased people awareness*
- *Involved community participation*
- *Created jobs*
- *Introduced " a clean culture attitude "*

This information matches well with the summary report from the Balikpapan city partner for this project where the population is estimated at 530,000 and the municipal solid waste generated has been reported as 1000m^3/day. From the waste generated, only 5% of the waste is re-used by

waste-recyclers. Final Waste Disposal (FWD) has been operating since 2000, and covers a landfill area of 5 ha and is designed for 10 years of operation. The FWD is almost full and if there are no efforts to reuse wastes from sources or at the FWD, there will be a shortage of FWD facilities, and it will need more funds to enlarge the landfill area. In addition, the increased waste accumulation in the FWD will increase air and water pollution by producing methane gas and waste liquor.

After going over the issues identified in the Balikpapan application, it seemed that the optimization of residential solid waste collection effort by ICLEI was of some help towards the aesthetic improvement of the city.

Summary Monthly Activities (October 2005):

*Dialogue with the City Partner, **Iloilo City**, Philippines.*

As a follow up to our letter sent on September 26, 2005 to Mr. Noel Z. Hechanova, City Environment & Natural Resources Officer, Iloilo City, Philippines, we sent a reminder on October 6 and got a reply where Mr. Hechanova provided the following information on the organizational setup of the Iloilo City and their Solid Waste Management Program.

Iloilo City Solid Waste Management Board (ICSWMB)

The Board consists of member representatives from different sectors:

a. National government agencies – 3 representatives
b. City Council – 2 representatives
c. City line departments – 7 representatives
d. Community – 1 representative
e. Private sector and NGO's – 4 representatives

Briefly, the Board's functions are:

a. Develop strategies and detailed programs and oversee their implementation;
b. Integrate various plans of the community;
c. Adoption of revenue generating measures; and
d. Monitoring and review.

The ICSWMB Technical Working Group

This group is a Task Force created by the Board to assist in preparing plans, reviewing technical proposals, and conducting periodic monitoring.

The group consists of representatives from the private sector (6), different departments of the city (4), national government agencies (2).

It is headed by a representative from the private sector, with the City ENRO, as the Vice-Chairperson.

The City General Services Office (GSO)

This Department operates the City's Controlled Dumpsite Facility and does the planning and monitoring of garbage collection services which is being provided by a private contractor.

In collaboration with the City ENRO, the GSO conducts meetings, orientation and information dissemination to the barangays (communities) of the city.

The City Environment and Natural Resources Office (City ENRO)

Mr. Hechanova is from this department. They are the designated Secretariat of the Solid Waste Management Board and the Technical Work Group. As Secretariat, they arrange for meetings and provide the necessary technical support and direction to the Board and the Working Group.

They also organize pilot communities for community-based solid waste management and do orientation and information dissemination in tandem with the City General Services Office.

City Waste Profile and Waste Management Facilities

- Waste Generation

-Annual Generated Daily (all sources, 2003) - 306,879 kg/day
- Per Capita (2003) - 0.604 kg/people/day
-Distribution

❑ Residential	-	75.48%
❑ Commercial	-	8.97%
❑ Market Waste	-	8.92%
❑ Institutional Waste	-	6.06%
❑ Street Sweeping	-	0.57%
		100%

WASTE COMPOSITION (2003)

❑ Paper, glass, metal, rubber/leather, textile	-	28.35%
❑ Plastic	-	15.10%
❑ Yard waste	-	13.29%
❑ Special	-	2.15%
❑ Hazardous	-	0.51%
❑ Kitchen waste	-	32.94%
❑ Other	-	6.88%

WASTE COLLECTION

- Year 2003 - 156.2 tons / day
- Year 2005 - 150 tons / day

SOLID WASTE MANAGEMENT FACILITIES

1. COLLECTION

- scheme - by private contractor
- equipment - 22 compactor trucks, 4 dump trucks
- personnel - 75
- no. of trips - 78
- others - 36 private haulers

2. CALAJUNAN DUMPSITE FACILITIES

- Dumping Area

23 hectares - Old Tipping and other facilities
4 hectares - Existing Controlled Dump
10 hectares - Available for sanitary landfill

They also have a Composting/Recycling Facility equipped with hammer mills, shredders, composting drums and other equipment. They have partly gravel and partly concrete access roads for the dumping area.

*Developing a model Solid Waste Management plan for **Iloilo City**, Philippines.*

The estimated population of Iloilo has been reported by Mr. Hechanova as 403,931 (projected 2005). Based upon the above information we prepared a conceptual plan for a demonstration scale Municipal Solid Waste Management Project and sent the same to them on October 24, 2005. A new disposal area (approximately 2 acres) is proposed to be selected by Engineers from S & M Engineering (SME) with help from the City Partners and in consultation with the Iloilo City Municipality and other local organizations. We also suggested that a medical waste management project could also be undertaken in the same fashion.

*Communication with the City Partner, **Balikpapan**, Indonesia*

After sending our initial letter and a number of follow-up letters by e-mail to our project contact, Mrs Lilis Marwiani, Head, Analysis & Evaluation Sub-division, Environmental Impact Assessment Agency (Bapedalda), Balikpapan City, Indonesia, we tried to establish contact through phone calls and Fax. We sent a few follow up letters as well in October and then followed through with a request to the ASEAN representative, Wendy Yap on October 23rd. Shortly after that on October 26, 2005 we heard from Ms. Marwiani who wrote that their computer system was down and she realized that the response was too late, but she was still hoping to get our support for

continuing partnership. In the next couple days she sent a short summary background of herself and one of her project team member, Amin Latief.
According to the information gathered from the Clean Cities Project initiative (Lesilolo, 2004) as we mentioned in our September 2005 report, only a temporary landfill facility exists in Balikpapan city and the facility is almost filled to capacity. We will be looking into rendering possible assistance to Balikpapan in their strategic planning and site selection process for locating a new landfill facility.

Summary Monthly Activities (November 2005):

Continuing Dialogue with the City Partner, ***Iloilo City****, Philippines.*

In response to the conceptual solid waste management plans sent to Mr. Hechanova, Iloilo City, Philippines, we received the following input:

1. The proposed solid waste management project by the Maryland team requires space and Iloilo city's public land is not available for that purpose.
2. They want to explore, for purposes of this exchange program, the possibility of piloting a program for Iloilo city's household toxic waste and medical waste.

In reply we mentioned that if it is more feasible and of better value to explore the areas of medical waste management and household toxic waste this should be a useful alternative. We requested them to let us know some of the options and methodologies that they plan to explore. We plan to provide some input in these two areas after we hear back from them. We also mentioned that we will be developing a schedule of activities and timeline once we hear back from them.

Continuing *Communication with the City Partner,* ***Balikpapan****, Indonesia*

We sent a note to Ms. Lilis Marwiani mentioning that we are thinking about providing some assistance with the following:

1. Developing a strategic waste management plan for Balikpapan, since there seems to be a need for a well thought out plan for an environmentally safe waste collection and disposal system for Balikpapan.
2. Locating a few potential waste disposal sites for Balikpapan based upon environmentally sound site selection criteria. We plan to use a GPS based mapping tool to help us in precise evaluation of the sites.

We requested them to let us know their views and any relevant information in reply.

We also checked on possible mercury disposal in Indonesia by PT Kelian Equatorial Mining (KEM) which is an example where sustainable practices were attempted (KEM 2003). The mercury that KEM produces as a by-product from retorting processes in the Gold Room has been stored in Process Plant. Total mercury produced since 1992 until 2003 was approximately 950 kgs. KEM is currently exploring options for responsible disposal of this mercury. Similarly a number of other industries are exploring disposal methodologies for hazardous wastes.

On November 11, Subijoy Dutta presented a Seminar at the Columbia University, NY on Sustainability of Mineral Resource Recovery with a global perspective. Mining practices in various countries were discussed.

Summary Monthly Activities (December 2005):

Continuing Dialogue with City Partners- ***Iloilo City and Balikpapan***

We have had a phone conversation with Mr. Hechanova, Project Leader for Iloilo City, Philippines, during December. We briefly discussed about the focus on household hazardous waste and medical waste management for Iloilo City. Mr. Hechanova was in the field at the time of the call and we requested him to let us know some of the options and methodologies that would be suitable for exploring to meet their needs better. We plan to provide some input in these two areas after we hear back from them. We mentioned about our plan to visit Iloilo City in early March 2006.

We have also mailed the book on *Environmental Treatment Technologies for Hazardous and Medical Waste – Remedial Scope and Efficacy* by Subijoy Dutta from our Calcutta office in mid December. The section on medical waste in this book should be useful in their understanding of medical waste management techniques and technologies.

We have also talked to Ms. Lilis Marwiani, Project Leader, Balikpapan, Indonesia almost every other week during December. Per our request she sent some data on municipal solid waste which had a few errors and is being rechecked and validated by them.

Planning Teleconference between Clean Land Team

On December 9 Bill Roper, Henry Ahn and Subijoy Dutta discussed the project plans and issues. Discussions were also held by Subijoy Dutta with other team members. The following issues were addressed by the team.

- Developing a strategic waste management plan and locating a few potential waste disposal sites for Balikpapan requires timely communication with the City Partner. Since we had some difficulties in getting timely response from Balikpapan we decided to chart a new course by starting bi-weekly phone conversation with Ms. Lilis Marwiani, project leader for Balikpapan, to get things moving.
- We discussed about the US Team visit to the City partners and came up with a plan to visit in early March 2006. Accordingly, we discussed with our city partners about their suitability and got an okay from them to visit then during the week of March 6-10, 2006.

Summary Monthly Activities (January 2006):

Options for Household Hazardous Waste Collection and Disposal - ***Iloilo City***

We have had a few e-mail communications with Mr. Hechanova, Project Leader for Iloilo City, Philippines, during January. We requested Mr. Hechanova to specify some of the options and methodologies for household hazardous waste (HHW) and medical wastes that will suit them better. In response they provided us with a draft initial proposal that specified their current status and need. Based upon their input we developed the following two plans and sent to them at the end of January.

1. Proposed Hazardous Waste Collection and Disposal Program for Iloilo City, Philippines.
2. Medical Waste Management Plan for Iloilo City, Philippines

The hazardous waste collection and disposal proposal was intended to assist the local authorities in setting the program goal and timeline for implementation of proper management steps in dealing with the hazardous waste in the greater Iloilo City, Philippines. There is a need for the general population to have a better understanding and awareness of the dangers and health impacts of improper management of household hazardous waste. This information needs to be developed with a meticulous emphasis and publicized through various publications and other media which cover a broad section of the local population. Data from local health department may provide valuable information in that regard. The first and foremost need is to educate and inform the people while developing the complete program including minimizing hazardous waste generation, pollution prevention, recycling, reuse, and developing a final disposal/treatment system for the hazardous waste.

1. Based upon the information provided by Mr. Hechanova in the initial proposal, a number of observations/comments were provided to them.

The proposal also had details on the household hazardous waste definition, categories and a list of common household wastes that fall under the hazardous waste category in US. The proposal also listed wastes that are generally excluded from the household hazardous waste collection program (e.g. explosives). The benefits of household hazardous waste collection were highlighted in the document. A general guidance for the residents and communities has also been provided. The proposal included specific information which should help them to determine the best ways to reduce, reuse, or dispose of common household products that may contain hazardous ingredients. Each community is different, and hence we suggested that it would be prudent to check with their local department of health and other responsible authorities for more information on HHW management options in their area.

A list of environmentally-friendly alternatives of hazardous waste products was tabulated in the proposal for public outreach and dissemination in Iloilo City, Philippines.

A detail plan with maps and drawings has been prepared for household hazardous waste collection centers and infrastructure development for Iloilo city, Philippines.

A disposal options/guidance for the residents was developed and included in the proposal.

The proposal also included the final disposal/treatment system options for the municipality and local Government.

The medical waste management plan included the need for proper characterization and subsequent development of a proper management plan for Medical Waste or Special Wastes as they are referred to locally. Some background and introduction on medical waste was provided in this document. Although the term medical waste often connotes potentially hazardous or infectious materials, such as dressings from wounds or needles and syringes, the majority of the waste generated by healthcare providers results from administrative and housekeeping activities and resembles the waste from our home or office. Thus, a key aspect of responsible waste management is to distinguish and segregate this basic solid waste fraction from wastes of greater concern, including biomedical, chemical, chemotherapeutic, and low-level radioactive wastes.

One challenge facing health care professionals, government agencies and environmentalists is the establishment of procedures to reduce the total quantity of medical waste generated. This reduction can be achieved most effectively by segregating the solid wastes from the hazard-bearing wastes. It may be enhanced by integrating waste prevention concepts into procurement procedures and training for medical personnel, including doctors, nurses, and laboratory technicians. We advocated that waste reduction can be optimized through a comprehensive program to oversee its environmentally sound segregation technique such as source separation, storage, transportation, treatment and disposal. Thus the fundamental message of Segregation, Segregation, and Segregation as the key steps to safe management of medical waste was conveyed to our city partner, Iloilo City, Philippines.

We provided them with details on composition of medical wastes and some data on health care waste generated by various Regions of the world based upon the World Health Organization's information.

We mentioned that the waste generation and medical waste composition for the greater Iloilo City needs to be specifically determined by gathering reliable local data. The major objective of the data collection or compilation effort would be to address the following:

1. Develop a Medical Waste Identification & Profile for the greater Iloilo city area. This should include the quantum of medical wastes generated with specific categorization of the type of waste.

2. A general evaluation and cost-benefit analysis of the waste categorization for the locally generated medical waste may be conducted to determine the most viable grouping for an effective treatment/disposal of the waste.

Medical waste minimization options will depend upon the above information. During our visit we will discuss possible options with the various stakeholders (Hospital management officials, Department of health, City officials and others) as arranged.

*Exchange of Information with **Balikpapan**, Indonesia*

We were actively involved in developing a Strategic Plan for Waste Management and Site Selection Criteria for Municipal Solid Waste disposal facility for Balikpapan.

We have developed the approach for the site selection by looking at the satellite imagery of the area first and communicating with our City partner about the possible options and locations.

Because of some errors in the data sent by our Balikpapan city partner, we proceeded with the information from the Clean Cities Program where waste collected was reported as 200 tons/day and waste generated was estimated at 350 Tons/day for 2004. Based upon this information from the Clean Cities program, we have started the development of the strategic plan.

Summary Monthly Activities (February 2006):

Options for Household Hazardous Waste Collection and Disposal - ***Iloilo City***

The mudslide in Leyte island was shocking and on behalf of the Maryland Team we sent our condolence note to Mr. Hechanova for this disaster. In reply Mr. Hechanova mentioned that there was no damage in Iloilo area due to the rain. The two plans sent to them on the Hazardous waste collection and disposal program and Medical waste management was being reviewed by the authorities in Iloilo city. We were waiting to get some feedback from Iloilo city before our planned trip to go there on March 4th. We were planning to discuss the issues during our visit and try to get a more detail feedback.

Exchange of Information with ***Balikpapan****, Indonesia*

We developed a Strategic Plan for Waste Management and Site Selection Criteria for Municipal Solid Waste disposal facility for Balikpapan and sent that to them in early February. The information sent by us included the following:

A. Development of a Strategic Waste Management Plan for Balikpapan, Indonesia

This strategic plan is prepared to help the progression of strategic thinking about proper environmental management and disposal of municipal solid waste generated in the greater Balikpapan area. It will also attempt to highlight important changes that are apparent in the program approaches and relationships.

Proper Strategy – Better Growth

Strategy

This strategy sets forth the following mission:

"The mission of the Balikpapan waste management authority/Municipality is to safeguard environmental quality, consistent with the social and economic needs of the city, so as to protect health, welfare, property and the quality of life."

The mission statement is reasonably broad in scope and carefully articulated to convey a motivational message. We must also work within the general policy boundaries that serve as a

framework for the waste management/Municipal authorities in Balikpapan, Indonesia. We focus on the protection of human health and the environment as our primary objective. Social and economic needs surely provide a sense of balance in the pursuit of environmental quality goals. Protection of health, welfare, property and the quality of life is included in the range and magnitude of our effort.

This strategy also set forth the following program goals to support the above mission statement:

1. Provide leadership to chart a new course for clean land which is responsive to relevant needs in Balikpapan and complies with priority aspects of the local Regulatory framework on the clean land.
2. Address the major solid and hazardous waste management concerns and participate, as appropriate, in a comprehensive program involving safe collection and disposal system for the solid and hazardous waste.
3. Utilize creative means to address the priority needs for solid waste management in Balikpapan and participate in the national scale to create a model for Indonesia.
4. Enhance capability to undertake environmental cleanup, when necessary, and to provide better service for private party actions.
5. Promote pollution prevention and market-based approaches for continued environmental progress.
6. Develop an environmental planning capability which emphasizes risk-based analysis, good science, sound data, and open communication and informed participation.
7. Ensure data validation and Quality Assurance/Quality Control of all data collected.

The strategic plan calls for developing Vision statements for 2010 and related near-term focus statements for each major program or activity. Some of the activities are listed below:

- Environmental Planning
- Pollution Prevention
- Chemical Safety
- Clean Air
- Clean Land
- Clean Water
- Agricultural matters
- Regulatory Services
- Laboratory Services
- Agency Support Services

This Strategy should help in guiding its operations during the specified time frame.

The near-term goal should set forth the following environmental priorities:

1. Reduction of toxics, especially mercury, and lead
2. Addressing ozone non-attainment.
3. Promoting sustainable development.
4. Protecting and restoring critical ecosystems.
5. Protection of people at risk, especially children and economically lagging communities.
6. Regulatory innovation.

Future Vision for Balikpapan

A primary performance measures chart was included to assist in the strategic planning process. During the project discussion amongst the local stakeholders some of the measures and examples of measures is planned to be completed during the development process.

Further details on Environmental Objectives, Environmental Indicators, Program goals, Program Implementation strategy, Roles and Responsibilities were also provided to Balikpapan.

B. *Site Selection for a Municipal Waste Disposal Facility in Balikpapan – Criteria Development*

Selecting a site for disposal of municipal solid waste involves a number of factors and calls for consideration of many technical, scientific, political, and economic issues.

Generally appropriate regulations/guidance are developed to include location restrictions to address both the potential effects that a municipal solid waste landfill unit may have on the surrounding environment, and the effects of natural and man-made conditions may have on the performance of the landfill unit. These criteria pertain to new and existing Landfill units and lateral expansions of existing units. The location criteria cover the following major factors:

1. Airport
2. Floodplains
3. Wetlands
4. Geologic Fault areas
5. Seismic impact zones, and
6. Unstable areas.

Floodplain, fault area, seismic impact zone, and unstable area restrictions address conditions that may have adverse effects on landfill performance that could lead to releases to the environment or disruptions of natural functions (e.g., floodplain flow restrictions). Airport safety, floodplain, and wetlands criteria are intended to restrict Landfill units in areas where sensitive natural environments and/or local people may be adversely affected.

Details on each of the above six criteria were tentatively specified and details were furnished to the Balikpapan City partner.

Summary Monthly Activities (March 2006):

*Visit to **Iloilo City, Philippines** – Exchange of information with the Iloilo City Team concerning Household Hazardous Waste and Medical Waste Management.*

A detail collection and disposal plan for the household hazardous waste was sent to the Iloilo City partner in February 2006. Based upon the elements of the plan and inputs from various stakeholders in Iloilo City a meeting, discussion forum, and site visits were arranged for the Maryland team on March 8th and 9th.

A number of recycling centers in various Barangays (villages/communities) were visited by the Maryland team. Mayor Jerry P. Treñas started the meeting and group discussion with a warm welcome to the Maryland team. The meeting was attended by about 40 people. The meeting agenda showing the names of various agencies and presenters is provided below.

Agenda (Iloilo City, Philippines), March 8, 2006

Time	
2:15 – 2:30	• Invocation - - - - - - - -by Neonita Gobuyan • Address by Mayor Jerry P. Treñas • Words of Welcome - - - - -by Ms. Segovia • Acknowledgement of Participants - - -CENRO
2: 30 – 2:45	• Overview of the Presentation- - -by Engr. Hechanova)
2:45 – 3:00	• Salient Provisions of RA 6969- Focusing on Hazardous, Toxic and Special generated Household and Hospitals and Medical Waste (by DENR-EMB, Engr. Bienvenido L. Lipayon)
3:00 – 3:30	• Presentation of Current Situation & disposal and other programs on Toxic, Hazardous and Special Wastes in Hospitals & Medical clinics. (by Dr. Lydia Depra Ramos, Dept. of Health)
3:30 – 3:45	• Situationer, Issues & Infra in Iloilo City By Engr. Helen Sotomil)
3:45 – 4:15	• Presentation of Hazardous Waste Collection System and Medical Waste Management Plan for Iloilo City, Phils. ------by Mr. Subijoy Dutta
4:15 – 5:00	OPEN FORUM - DISCUSSION Facilitated by Mr. Roni S.J. Peñalosa, CPDO Coordinator
5:00 – 5:10	P R O C E S S I N G
5:15	Closing Program - - - - -by a Member of the Board

Figure 6 shows a picture of the Maryland team with various participants and the Mayor of Iloilo City, Philippines.

Figure 6. Maryland Team with the Mayor and Iloilo City Team.

Mr. Noel Hechanova (next to W. Roper on the Photo above**),** from city ENRO (Environment and Natural Resources Office), provided the current situation. A summary of the information provided by Mr. Hechanova is provided below:

Current Situation as of March 8, 2006

1. The City's 2003 waste composition study revealed that hazardous waste accounted for 0.51%, and special waste (Medical) accounts for 2.15%.
2. The hazardous wastes identified were oil, oil filters, small batteries and others.
3. On the other hand, special wastes identified were syringe, sharps, gauze, diapers, pathological and others.
4. Republic Act 6969 governs hazardous waste.
5. Hazardous waste as define by the act is any waste exhibiting the characteristics of ignitability, corrosively, reactivity & toxic.
6. The city's business establishments are predominantly trading (51.3% are engage in retailing & wholesaling) and community services (33% are engaged in restaurants & small repair shops others).
7. Manufacturing accounts for 3% of the total, so it is safe to assume that hazardous waste are generated domestically & by hospitals, as the figures indicate above.
8. The Dept. of Health provides guidelines to Hospitals & implements the Health Care Waste Management Manual.

The Need

- ✧ The City has not embarked in any hazardous waste program at the moment.

- ✧ There are not enough public information on the effects of toxic chemicals and the city does not want to risk the health of its constituent, the air and/ or is water bodies (3 rivers, and coastal areas)
- ✧ There is the need for cooperation between the City and the National Government (through the Dept. of Health) in addressing special or hospital waste.
- ✧ There is the need to pilot appropriate methods/ technologies for the collection, treatment & disposal of such waste.

Stakeholders

1. WE HEAL – a group of volunteer medical practitioners helping the city in Solid Waste Management.
2. Department of Health (DOH)
3. City ENRO (Mr. Noel Hechanova's Office)
4. The office of the City Health Office
5. The office of the General Services
6. Representatives from Hospitals
7. Representatives from the Barangays (Villages)

Some of the existing regulations and their applicability were presented by Engineer **(Engr**.) **Bienvenido L. Lipayon** from the Department of Environment and Natural Resources (DENR). A few sample regulatory requirements from Mr. Lipayaon's presentation are provided below:

Republic Act 6969, Hazardous Waste Section 26-31 (Iloilo City, Philippines**)**

- Waste Generator :
  - Determine if waste is hazardous
  - Register as waste generator for issuance of DENR ID No.
  - Submit quarterly report as HW generator
  - Responsible for storage, labeling of waste
  - Submit contingency/emergency plan
  - Conduct personnel training on handling of hazardous waste.
- Transporter of Waste:
  - Register or Accredit as Waste Transporter
  - Secure Transport Permit
  - Use Manifest form during transport of Hazardous Waste
- Treater/Recyclers:
  - Secure ECC
  - Registered with EMB as Treater/Recyclers
  - Submit Certificate of Treatment and report to EMB
- Import into the country or export of hazardous substances must seek and obtain prior written approval.
- Seizure of importer hazardous substance which does not comply with the permit, return the hazardous to the port of origin and initiate proceeding to recover cost.

Dr. Lydia Depra Ramos, Dept. of Health (DOH) presented the current situation and disposal practices for Toxic, Hazardous and Special Wastes from Hospitals & Medical Clinics.

Engr. Ms. Helen Sotomil (dressed in Green Suite in Figure 6 above) presented the Issues and Infrastructure in Iloilo City. A few slides from her presentation are provided below.

- The ave. per capita waste generation = 0.604 kg/person/day
- The projected SW generation (mt/day) of residential wastes from the from 2003- 2013.

Year	Projected SW Generation mt/day
2003	229
2004	236
2005	243
2006	251
2007	259
2008	267
2009	275
2010	284
2011	293
2012	302
2013	311

Municipal Solid Waste Composition in Iloilo City as of 2003

Category	%
Rubber/ Leather	2.35
Others	0.77
Paper	21.64
Glass	2.98
Metal	1.69
Plastic	15.10
Kitchen Waste	32.94
Other Organics	0.13
Other Inorganics	6.75
Hazardous	0.51
Special Wastes	2.51
Yard Wastes	13.29
Textiles	1.69

Hazardous waste generated in greater Iloilo City

- Dry cells
- Incandescent & Fluorescent lamps
- Used electronic devices
- Used Oil

- Used incandescent & fluorescent lamps
- Paint containers
- Lead batteries
- Used/ spent chemicals
- Special wastes (bio-medical, pathological) from clinics & hospitals
- Containers of Cobalt (radioactive waste), etc.

Current and Projected amount of hazardous waste generated in greater Iloilo City

Year	HH Solid Waste mt /day	Hazardous Wastes (Kg)
2003	229	1,169.9
2004	236	1,203.6
2005	243	1,239.3
2006	251	1,280.1
2007	259	1,320.9

Issues and Needs

- Lack Of Iec On How To Dispose, Extent Of Impacts On Health & Environment
- Lack Of Disposal Facility In The City
- Lack Of Collaboration Between The City Government & DOH

Subijoy Dutta from the Maryland Team presented a collection and disposal plan for the household hazardous and medical waste.

Medical Waste treatment Technologies:
Various medical waste treatment technologies and their advantages and disadvantages were covered in the next few slides.

After a few questions and answers, a vibrant discussion forum began with the facilitation of Mr. Roni Penalosa. Numerous problems and issues were discussed by the stakeholders/participants. The presence of the Mayor helped in getting better clarifications in a number of issues. One of the major highlights of the discussion forum was the instant creation of the **Focus Group** as stressed by Mr. Dutta initiated by Engr. Ms. Helen Sotomil. Many stakeholders joined the group and discussed about periodic meetings amongst themselves to develop a hazardous waste collection program and a suitable Medical waste management plan for Iloilo City.

The existing landfill site was visited by the Maryland team on March 9th and disposal options and locations for hazardous waste were discussed with Mr. Hechanova.

*Visit to **Balikpapan, Indonesia** – Meeting with the Balikpapan Team concerning a strategic plan for disposal of Municipal Solid Waste and developing site selection criteria for a Municipal Landfill.*

The Balikpapan city partners were quite enthusiastic about the Clean Land project and arranged a meeting on March 10th after the Maryland team arrived there. About 25 people attended the meeting which included the Head of the EIA (Environment Department, Mr. Ayahrun Syah), head of cleaning division, head of local planning and development board (Mr. Tara Allorante), head of final disposal technical unit (Hairul Ilodit), private companies, various local organizations (Ms. Lilis Marwiani, Mr. Amin Latif, EIA, Ms. Aina, Bina Karya Indah Foundation, Air Program), NGOs (Anton Padmawijaya, Peduli Foundation), Mayor's Office, and other Stakeholders. The Deputy Mayor, Mr. Heru Bambang, also joined the meeting later. Ms. Elok (Mayor's office) facilitated the meeting, and our primary contact, Ms. Lilis Marwiani, led the technical discussions.

A presentation was first made by the Balikpapan EIA about their existing Municipal Solid Waste facility and clinical waste incineration program. The existing landfill system was designed to have a waste pile height of 24 meter or 75 ft. The present condition of the landfill indicated highly unstable piles at a height of about 9 meter or 30 ft. The incinerator shed has also been placed at the bottom of the waste pile causing high vulnerability and further limitation to the disposal facility (Figure 7)

Figure 7 Incinerator facility near Manggar Landfill Site (March 10, 2006).

An alternative landfill site at Taritip area is also being considered by the EIA. This alternate disposal site is in Taritip Sub District about 10 km to north of the Manggar Landfil site. It has about 50 Hectare available land for Solid waste disposal.
A visit to the alternative disposal site was made on March 11. Figure 8 shows the new area.

Figure 8. Alternative Landfill Site at Taritip Sub District for Balikpapan, Indonesia.

Summary Monthly Activities (April 2006)

Follow up on Household Hazardous Waste Collection System and Medical Waste Management with ***Iloilo City, Philippines***

Based upon our visit to Iloilo City last March and the meetings and discussion held with the Iloilo City partner and various stakeholders we have requested our primary contact there to provide us with input from the Green Focus Group in Iloilo City on the hazardous waste collection plan and the medical waste management plan developed by us for the city partner. The Green Focus Group was formed instantaneously during our meeting at the Mayor's Office involving various stakeholders during our visit on March 8, 2006. A picture of active group discussion during our visit is shown in Figure 9 below.

Figure 9. Group discussion at the Mayor's Office in Iloilo City, Philippines

We have received a number of messages from our primary contact, Mr. Noel Hechanova who wrote " ….With regards to your recent visit to Iloilo City, the Mayor is very grateful and was pleased w/ the progress of the exchange program. We all looked forward for a fruitful partnership w/ you and your colleagues…"

*Follow up on **Balikpapan, Indonesia** – about strategic plan for disposal of Municipal Solid Waste and developing site selection criteria for a Municipal Landfill.*

We have been pursuing follow up activities with the Balikpapan city partner. Our primary point of contact, Ms. Lilis Marwiani, was mostly tied up in Visa related issues this month and has visited the US Embassy in Jakarta on April 6, 2006.

However, she conveyed that some of the waste management problems pointed out by us during our visit got the City officials concerned about their existing landfill operations and they have taken corrective steps to remedy a few of them. In one such action they have moved the mounting trash pile next to the incinerator at the present landfill to a distant area and rearranged the placement of trash with a milder slope to reduce the threat of a landslide. Figure 10 shows the picture of the landfill facility and the background area surrounding the landfill during our visit on March 10 2006. According to Ms. Marwiani this has been changed now to improve stability.

Figure 10. Manggar Landfill site, Balikpapan, Indonesia (Mar 10, 2006)

Arrangements for Exchange Visit for the City Partners

We have been pursuing various efforts to arrange for the exchange visa for our City partners to visit US in June 2006. With great help from CSG in completing various visa forms and requirements we have made some progress for our participant from Iloilo City. CSG was working with the US Embassy in Indonesia to get one of the required forms (DS-2019) processed for the visa for our city partner in Indonesia.

Summary Monthly Activities (May 2006)

Arranging the Exchange Visit for the City Partners

Because of the complexities in the visa process for the exchange visitors, we had to gather and submit a lot of information on the visitors and about the proposed program to CSG for completing the required paper works by using an online system from here prior to processing of the visa in the respective countries. The information for both of our city partners, Iloilo city, Philippines, and Balikpapan, Indonesia were processed by CSG as quickly as possible. However, due to some specific system requirements in Indonesia the exchange visa for our Balikpapan City partner (Ms.

Lilis Marwiani) was not approved by the consulate in Jakarta, Indonesia. The exchange visa for the Iloilo city partner (Mr. Noel Hechanova) was granted by the consulate in Manila.

To arrange for a follow up training for our Balikpapan city Partner, we were setting up a program in Iloilo City, Philippines during August 2006, where Ms. Marwiani from Indonesia would visit for a short training and we will have Mr. Gary Huffman, our team member from Colorado, go there and provide the training to the city partners there. We planned to arrange the program in Iloilo City from August 15 – 18, 2006.

*Follow up on Household Hazardous Waste Collection Program and Medical Waste Management – **Iloilo City**, Philippines*

We have analyzed some of the field data collected during our visit and determined suitability of a few locations in the greater Iloilo City area for their use as a household hazardous waste collection centers. We have also digitized the map of Iloilo city and marked the tentative locations of household hazardous waste collection centers in there.

Our city partners from Iloilo have also sent drawings and plans for the proposed engineered landfill for the Iloilo City. The manual from the Department of Health (DOH) has also been sent to us. The DOH manual is considered as the guideline for managing medical waste in Philippines. We would be reviewing those and provide necessary comments.

The GPS coordinates recorded by us for a number of sites during our visit on Mar 8 and 9, 2006 are provided in Table 4 below.

Table 4 – GPS Readings of Sites Marked during Visit

Location	**Elevation**	**Lat/Long**	
	Ft.	Deg Min. Sec.	
Proposed HHW CC1	55.0	N10 43 02.2 E122 33 21.4	
Proposed HHW CC2	78.0	N10 41 13.5 E122 30 57.1	
Calhnan Landfill	5.0	N10 42 47.9 E122 31 28.7	
City Hall	15.0	N10 41 38.2 E122 34 24.6	
Batialo River	54.0	N10 40 51.0 E122 31 02.4	

*Follow up on strategic plan for disposal of Municipal Solid Waste and developing site selection criteria for a Municipal Landfill – **Balikpapan, Indonesia***

We have been pursuing follow up activities with the Balikpapan city partner. We have talked to our primary point of contact, Ms. Lilis Marwiani a number of times during May 2006 and she has

been updating us on their progress in stabilizing the waste piles on the existing landfill. She indicated that they are also looking into the strategic plan and checking as to how much of the proposed plan can be used directly by them. The GPS location map and readings marked during our visit for the Balikpapan area are provided in Figure 11 and Table 5 below.

Figure 11. GPS Location Map, Balikpapan, Indonesia (Mar 10, 2006)

Table 5. GPS Readings of Sites marked during Balikpapan visit

Location	Latitude	Longitude	Elevation	Date/Time	Remarks
	D-M-S	D-M-S	Feet		
BPNARPT Airport - 1	S 01-15-39.4	E 116-53-56.1	55	3/10/06 7:00 PM	Arprt gate during return from LF Visit
BPN Mnrd Mainroad - 2	S 01-15-31.5	E 116-55-06.5	183	3/10/06 5:35 PM	Main Road on way to LF site
MAMGGR Road - 3	S 01-13-38.6	E 116-57-39.8	42	3/10/06 6:46 PM	Manggar Road Junction at Main Rd
LF Lchttmnt LF	S 01-12-44.6	E 116-56-18.2	107	3/10/06 6:18 PM	LF Leachate Treatment

Location	Latitude	Longitude	Elevation	Date/Time	Remarks
Leachate Treatmnt-4					
LF BPN - 5	S 01-12-41.1	E 116-56-30.0	216	3/10/06 5:51 PM	Existing Manggar Landfill
DwntnBPN Downtown BPN - 6	S 01-16-37.7	E 116-50-19.9	30	3/10/06 7:13 PM	DownTown Hotel Benakutai
LF Altsite - 7	S 01-10-51.5	E 116-59-44.0	53	3/11/06 9:03 AM	Alternative Landfill site at Teritip

Summary Monthly Activities (June 2006):

*Exchange Visit by the **Iloilo City** Partner*

As planned our participant from Iloilo City, Philippines, Mr. Noel Hechanova arrived in Baltimore, Maryland on June 24th. The exchange visits and meetings went according to the plan as listed below:

Exchange Visit – Clean Land 2005 Project

Visitor: Mr. Noel Hechanova, Iloilo City, Philippines

Project Focus:

Philippines - Household Hazardous waste and Medical Waste Management
Indonesia - Strategic Waste Management Plan and Site selection criteria for a Solid Waste disposal facility -

Date	Event	Coordinator
June 25 (Sun)	Welcome/Orientation	Subijoy Dutta,
June 26 (Mon)	Visit to a Hazardous waste collection and disposal facility	Subijoy Dutta,
June 27 (Tue)	Visit to Columbia University, New York	Dr. P. Somasundaran
June 29 (Thurs)	Return to Maryland	Subijoy Dutta,
June 30 (Fri)	Exchange Workshop – Patuxent Wildlife Visitor Center, laurel, MD	Subijoy Dutta, & Ellen Golden
July 1-2 (Sat/Sun)	Visited Ocean City, Maryland And local attractions	Subijoy Dutta,
July 3 (Mon)	Visit to Delaware Sites	Dr. William Roper
July 4 (Tue)	Local Attractions (DC - Independence Day)	Subijoy Dutta,
July 5 (Wed)	Visit to University of Maryland Ctr for Env. Science	Dr. Waqi Alam & Dave Nemazie

July 6 (Thurs)	Visit to Maryland TEDCO	Henry Ahn & Subijoy Dutta
July 7 (Friday)	Visitor returns to Philippines	Subijoy Dutta,

Mr. Noel Hechanova was received with a warm welcome at the BWI airport by the Maryland team upon arrival at 8:30 AM on June 24 and an orientation was arranged on June 25 when the Maryland team members provided some introductory local information to our Iloilo City partner. Mr. Hechanova also exchanged similar information about Iloilo City, Philippines and shared information about his team members in Iloilo city. Maryland team members also briefed Mr. Hechanova about some of the common practices used in shops and businesses here.

On June 26th the Baltimore County's Eastern Sanitary Landfill site and household hazardous waste collection center was visited by Mr. Hechanova along with Subijoy Dutta of the Maryland team. Mr. Jerry Siewierski (esiewierski@co.ba.md.us), program manager for the Household Hazardous Waste, Baltimore County, Maryland provided a very detail tour of the facility including relevant background on overall planning, capacity, and load shared by the Eastern Sanitary Landfill. According to Mr. Siewierski the total amount of disposal at this site is 160,000 tons/yr. The total waste generated by the Baltimore County is about 750,000 tons/yr. A picture of the ongoing operation at this landfill site is shown on Figure 12.

Figure 12. Active Operation at the Eastern Sanitary Landfill, Baltimore, Maryland (Photo: Subijoy Dutta)

The household hazardous waste (HHW) collection facility was visited thereafter. Figure 13 shows a picture of Mr. Siewierski and Mr. Hechanova in front of the HHW collection center.

Figure 13. Mr. Jerry Siewierski and Mr. Noel Hechanova (L to R) at the HHW collection facility in Baltimore, MD (Photo: Subijoy Dutta)

The (HHW) facility is operated by Baltimore County in cooperation with the Baltimore County Department of Public Works and is authorized to routinely accept household hazardous waste materials, such as paints, chemicals and automotive fluids. Hazardous materials from small quantity generators, or non-hazardous materials from businesses or government agencies, may be accepted on a case by case basis following approval by Jerry Siewierski. Materials are accepted during normal landfill hours Monday-Saturday 7:30 A.M. — 3:30 P.M. from April through October. Residents are advised by the facility operator (or by sign placed at the facility when the operator is not available) to place the materials into the roll off containers provided for storage of incoming materials. The operator obtains the zip codes of residents dropping off materials and tally on the daily log sheet. The operator obtains as much information as possible from the resident concerning unknown or unlabelled materials and notes the information on the container or on a piece of paper which is later attached to the container. The operator distributes flyers or other educational materials, provided by the county to residents dropping off materials and answers any questions or refers questions to Jerry Siewierski.

HHW Classification for acceptable Incoming Materials at this facility is provided below:

A. *Flammable Materials (55ga1 drum/bulk)*
1. automotive brake and transmission fluids
2. lighter fluids
3. paints (oil based alkyd)
4. solvents (organic)
5. stains, varnishes and strippers (organic)
6. wood treatment chemicals including PCP
7. vegetable oil, lamp oil

B Pesticides (55 gal drum/lab pack Isolid, liquid, aerosol)
I. cyanide containing materials
2. herbicides including lawn treatment fertilizers
3. creosote
4. pesticides

C Acids (55 gal drum/ bulk/liquid)
1. concentrated mineral acids (including: muriatic, hydrochloric, nitric, sulfuric. etc)
2. battery acid (electrolyte)
3. organic acids (including: oxalic, citric, etc)

D Acids (55 gal drum/lab pack/solid)
I. concentrated mineral acids in solid form

E Caustics (55ga1 drum/bulk/liquid)
1. concentrated alkaline solutions (hydroxide, etc)
2. caustic drain cleaner (liquid)

F Caustics (55 gal drum/lab pack/solid)
1. caustic drain cleaner (solid)
2. ammonia cleaners (solid or liquid)

G Oxidizer
1. chlorine bleach
2. pool disinfectants
3. peroxides, perchlorates nitrates, permanganates

H Reactive Chemicals (5gaI bucket/lab pack)
1. organic ethers
2. sodium, lithium or magnesium metals
3. phosphorus
4. aluminum dusts
5. picric acid or other shock sensitive materials
6. zinc dust
7. nitrophenol
8. sodium selenite

I Poisons (5 gal bucket/lab pack)
1. sulfides and sulfites
2. dioxins
3. nicotine compounds

J Automotive Oils (landfill collection tanks)
1. heating oil, motor oil, kerosene, diesel fuel, transmission fluid
2. anti-freeze
3. gasoline

K Mercurv Containing Materials (5 gal bucket/cardboard containers)
1. thermometers. thermostats. liquid
2. fluorescent light bulbs

The visit was quite informative and it provided a hands-on lesson towards setting up a HHW collection center in Iloilo City, Philippines for Mr. Hechanova.

On June 27 Mr. Hechanova traveled to New York City for a visit to the Columbia University and to meet with one of our expert team member, Prof. P. Somasundaran. After a brief exchange of information at the University on that day, Dr. Somasundaran accompanied Mr. Hechanova for a site visit on June 28th to New Jersey's largest waste-to-energy facility, owned and operated by Covanta Energy, which serves the refuse disposal needs of 22 municipalities in Essex County and the surrounding region.

The Essex County Resource Recovery Facility opened in 1990, and is considered as one of the smoothest plant start-ups in industry history. Today the facility combusts 2,800 tons per day of municipal solid waste and generates approximately 65 megawatts of electricity for sale.

Essex County, New Jersey, sponsored the facility. The reduction of the county's landfill requirements and the recovery of energy from the Essex County solid waste stream in an environmentally sound manner are among the benefits the facility brings to the community. Some of the technical data of this facility is provided below:

Capacity: 2,800 tons per day
Number of Process Lines: Three @ 933 tons per day
Type of Stoker Grate: Duesseldorf Roller Grate
Boiler Outlet: System Steam Conditions at 211,000 lbs/hr @ 650 psia/7500F
Turbine-Generators: Two 35 nominal megawatt units
Air Quality Control: Three DBA electrostatic precipitators and three spray dry scrubber systems
Stack Height: 279 feet
Bunker Capacity: 14,000 tons
Secondary Materials Recovery: Ferrous materials from post-incinerated ash

After a comprehensive visit to the Columbia University and the Waste recovery facility in New Jersey the participant returned to Maryland on June 29th.

Exchange Workshop at the National Wildlife Visitor Center in Laurel, Maryland

On June 30th the above workshop took place near the Patuxent Wildlife Research Center in Laurel, Maryland. The workshop focused on Innovative and Realistic Approach in Waste Management. The workshop was attended by the Maryland team members including Gary Huffman from Colorado, TEDCO, CSG from DC, N.C. Vasuki, Chief Technical Officer, Delaware Solid Waste Authority, and Noel Hechanova, Iloilo City, Philippines.

After a short introduction of the participants, Ms. Ellen Golden from the Council of State Governments (CSG) provided a short synopsis of the Clean land, Clean water and Clean Air program by the CSG/ State Environmental Initiative (SEI). The Clean Land 2005 project background was then presented by Mr. Subijoy Dutta.

Mr. Hechanova presented the status of waste management in Iloilo City thereafter. Information on waste management in Iloilo was covered in a number of slides by Mr. Hechanova.

A few slides from Mr. Hechanova's presentation covering the demographic information on Iloilo City is provided in Figures 14 below.

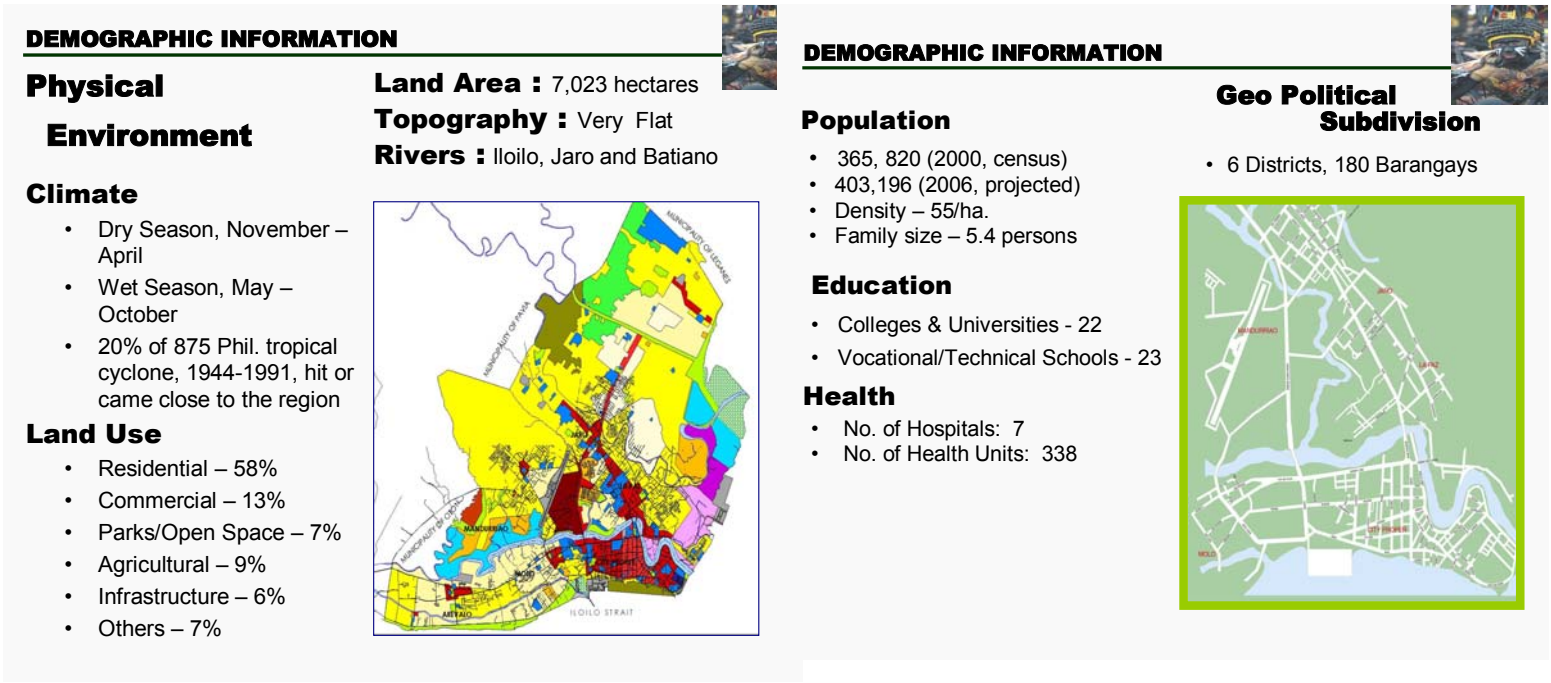

Figure 14. Demographic Information on Iloilo City, Philippines.

The presentation was followed by a question/answer session.

After a short lunch break thereafter the afternoon session got a sparkling start with a number of innovative waste management practices in Delaware as presented by Dr. N.C. Vasuki, CTO, Delaware Solid Waste Authority. Information from Dr. Vasuki's presentation are provided below.

Delaware Environmental Problems

- During the 1960's there was no state regulations for disposing municipal and industrial solid wastes.
- There were over 100 open dumps where solid waste was disposed.
- Over 70 % of the drinking water in the State comes from ground water aquifers.

Regional Authority

- In 1975, Delaware's Governor decided that local governments were unwilling to clean up their solid waste dumps.
- He created a new organization – Delaware Solid Waste Authority (DSWA) with the full support of both political parties.
- DSWA became responsible for planning and implementation of a long range statewide solid waste management program

DSWA Facilities

- 3 active Sanitary Landfills designed, constructed, and operated statewide.
- 1 Transfer Station, 2 more under construction
- 5 household bag waste collection stations
- Delaware Recycling Center
- Over 145 RECYCLE DELAWARE Drop-off centers

Delaware facts

- The second smallest state
- 2005 Population: about 845,000 (est.)
- Expect to grow about 1.5 % per year
- 2020 Population: about 1,088,000
- Delawareans generate about 1,200 lbs of residential solid
- wastes (RSW) per person per year.
- Delawareans separate about 170 lbs of recyclable materials per person per year.
- The remaining 1,030 lbs are landfilled requiring about one cubic yard of landfill volume per person per year.

DSWA Tonnage

Fiscal Year 2004

	Tons
• New Castle County	638,200
• Kent County	130,700
• Sussex County	225,800
TOTAL	*994,700*

Comparison of the Daily Cost of Goods and Services per person

- Hamburger $1.75

- 20 oz. Soft Drink $1.00
- Coffee $0.80
- Newspaper $0.50
- Garbage Collection $0.15
- Garbage Disposal $0.10
- Digital cable TV $0.64

After the Delaware case studies, Mr. Gary Huffman from the Enviro Products International, LLC , Colorado, presented some of their innovation and approaches in binding waste materials to produce useful products. Mr. Huffman discussed various binder systems that they studied such as:

- Cement
- Modified Cement
- Foamed Cement
- Organic Polymers
- Inorganic Polymers

Various advantages of the systems were listed as follows:

- Bonds to virtually all inorganic and most organic materials as the dispersed matrix fillers
  - Bonding can be modified with additives
  - Usually accepts up to 85% dispersed matrix filler

Follow up on strategic plan for disposal of Municipal Solid Waste and developing site selection criteria for a Municipal Landfill – ***Balikpapan, Indonesia***

We have sent further information to Balikpapan, Indonesia. During the site visits with the Iloilo City partner we also looked at information concerning landfill site selection and operational criteria which could be useful for Balikpapan. The Eastern Sanitary Landfill site at Baltimore had a very similar setting as the alternative landfill site at Balikpapan.

Summary Monthly Activities (July 2006):

Exchange Visit by the ***Iloilo City*** *Partner*

After the Exchange Workshop on June 30, 2006, visits to a number of sites by our participant from Iloilo City, Philippines, Mr. Noel Hechanova continued according to the following program.

Project Focus:

Philippines - Household Hazardous waste and Medical Waste Management

Date	Event	Coordinator
June 25 (Sun)	Welcome/Orientation	Subijoy Dutta,
June 26 (Mon)	Visit to a Hazardous waste collection and disposal facility	Subijoy Dutta,
June 27 (Tue)	Visit to Columbia University, New York	Dr. P. Somasundaran

June 29 (Thurs)	Return to Maryland	Subijoy Dutta,
June 30 (Fri)	Exchange Workshop – Patuxent Wildlife Visitor Center, laurel, MD	Subijoy Dutta, & Ellen Golden
July 1-2 (Sat/Sun)	Visited Ocean City, Maryland And local attractions	Subijoy Dutta,
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July 4 (Tue)	Local Attractions (DC - Independence Day)	Subijoy Dutta,
July 5 (Wed)	Visit to University of Maryland Ctr for Env. Science	Dr. Waqi Alam & Dave Nemazie
July 6 (Thurs)	Visit to Maryland TEDCO	Henry Ahn & Subijoy Dutta
July 7 (Friday)	Visitor returns to Philippines	Subijoy Dutta,

Visit to Delaware:

Dr. William E. Roper from the George Mason University provided the Delaware site visits to our Iloilo city partner, Noel Hechanova on July 3, 2006. Site characteristics of one of the landfills are provided below:

NSWMC-Cherry Island Landfill

- DSWA opened Phase I in 1985
- Solid Waste 638,200 tons in FY' 04
- Average 2127 tons a day being landfilled
- 513 Acres (219 In Use - 104 Future Use - 190 Buffer)
- Acquired Army Corp. of Engineers Property over 160 acres
- Avg. Number Vehicles Across Scale: 576

Delaware has a well planned recycling center. A picture is provided in Figure 15 below.

Figure 15. The Delaware Recycling Center (Photo: Courtesy DSWA)

Visit To The Center For Environmental Sciences, University Of Maryland - Cambridge, Maryland

This visit was arranged to provide an opportunity for Mr. Noel Hechanova, Environmental Engineer of Iloilo City, Philippines, for an interactive exchange on use of various methodologies in protecting the Chesapeake Bay from Environmental stressors/pollutants. The University of Maryland's Center for Environmental Science (UMCES) was the host for this event.

Dr. Waqi Alam of Tetrahedron, Inc., Maryland accompanied Mr. Noel Hechanova to the Center for Environmental Science in Cambridge, in the Eastern shore of Maryland. Mr. David A. Nemazie, Assistant to the President of the Center, received them and introduced them to Dr. Donald Meritt (Agriculture Agent) and they gave a brief presentation of the function of the center and how it is developing methods for monitoring and protecting the Chesapeake Bay. He discussed the sensitive ecology of the Bay and the stressors such as pollutants including nitrates, human activities (such as excessive fishing and developments) and abnormal volumes of water (excessive rain or draught) that can create adverse conditions for environment. The Bay is unique in the sense that it receives water from a tremendous large tract of land that covers the states of Maryland, Virginia, Delaware and Pennsylvania. It is habitat to several sensitive species of fish ad animals. It may be noted that the Eastern shore region is similar to the Iloilo City region, which is also surrounded by water body and has similar pollution problems.

Visit to Local Attractions and Ocean City Maryland

Mr. Subijoy Dutta accompanied Mr. Hechanova to most of the sites and local attractions during the exchange visit to Maryland. To make Mr. Hechanova feel homely and to enable him to see the day-to-day lifestyle of typical Marylanders, he was introduced to some local people/residents in Crofton, Maryland area. He attended a couple Church services on Sundays with local residents. These interactions provided a true welcome, homely feeling and a great depth of understanding to Mr. Noel Hechanova.

The shorelines and beaches around Iloilo City, Philippines had many similarities with Ocean City, Maryland as observed by Mr. Hechanova. The waste management system for the tourist town of Ocean city was closely observed and noted by Mr. Hechanova.

*Developing Fact Sheets on Household Hazardous Waste for the **Iloilo City** Partner*

During the exchange visit to Maryland Mr. Noel Hechanova mentioned that one of the most important factors in establishing a successful household hazardous waste (HHW) collection and disposal program is to have full citizen's cooperation and partnership in the HHW management. To get a high level of partnership they needed some fact sheets on common household hazardous wastes which they would distribute to the communities for heightened awareness amongst residents about the dangers and health risks posed by the HHW. Accordingly we developed a number of fact sheets on HHW and sent that to Iloilo City which have been translated in local language by the city partner and were distributed to local residents, localities, and Barangays.

In an e-mail in July Mr. Hechanova mentioned in an e-mail about the fact sheet "….*The information we received from you about bleaches, batteries and acids were very helpful. From it we have officially launch the Pilot Program in Brgy. Sta. Filomena with the following atteding our technical meeting:*

1. *members of the Brgy. Solid Waste Mgt. committee*
2. *Brgy. Officials*
3. *Officials from the School nearby*
4. *MRF operators*
5. *Some Residence*

Resource persons were from my technical staff who explained the different HH hazardous and its effects on Human.

The staff from the Env't. Mgt. Bureau was also invited. He gave the audience additional informations.

We have started giving out information materials to residents using your information. the format is attached. Information is now on going & we are expecting hazardous waste to be coming in the next few days."

*Review of Plans and setting up the Tasks for **Balikpapan, Indonesia***

We reviewed the strategic plans sent to Balikpapan, Indonesia and requested our city partner to accomplish the following two tasks with our active assistance for the clean land 2005 project.

1. Considering the pros and cons of the alternative landfill site based upon the site selection criteria that we have provided, arrive at a decision about selection of the final disposal site.
2. Finalize the draft strategic plan for the municipal solid waste according to your local suitability and confirm that with a letter of approval from your local authority.

In addition to the information provided to our Balikpapan city partner so far, we planned to provide them with another analysis of pros and cons of the alternative landfill site based upon the site selection criteria developed for Balikpapan. The alternate landfill site is very similar to the one we recently showed to the Iloilo city Participant, Mr. Noel Hechanova in Baltimore, Maryland (160,000 tons/yr or about 500 tons/day). The details of the site visit was planned to be elaborated to our Balikpapan city partner during the Exchange visit to Iloilo City in August 2006.

Summary Monthly Activities (August 2006):

*Follow up Report on Exchange Visit by the **Iloilo City** Partner*

A summary report with highlights of the exchange visit to US has been sent to us recently by Mr. Noel Hechanova, Department Head, Environment and Natural Resources Office (ENRO), Iloilo city, Philippines. The program seems to have provided a valuable insight to our city partner as indicated in the following excerpt ("lessons learned") from the report by Mr. Noel Z. Hechanova.

"Lessons Learned

- The Baltimore and Delaware Sanitary Landfill has enhanced my knowledge on the operating aspect of a sanitary landfill as well as in the establishment of waste recycling program. I had been particularly impressed on the initiative of Mr. Vasuki of the DSWA in establishing a number of successful recycling program. His philosophy of understanding the market before asking the customer to divert their waste to recycling does certainly makes a lot of sense. I can see that many of the DSWA's recycling strategies and scheme are replicable here in our city.
- The household hazardous waste management facilities I saw enhanced also my ideas about household hazardous waste management. The way Baltimore County managed their hazardous waste has inspired me, gave me several ideas with which I can use to initiate our own program.

- I have particularly noted that many household hazardous waste are recyclable or useful to some. It is just a matter of identifying who will take it.

- The waste to energy facilities is not new. We have already received several proposal for our city. The trip gave me the experience to be inside a facility that has been running successfully for years. What is amazing about the Covanta Essex is their air pollution control management. For many years now we have banned the use of incinerators in line with our Clean Air Act, for the reason that we are not sure about controlling dioxin and other pollutants that may result from burning garbage. My trip to the facilities have change my views about banning incinerators. I have also particularly noted the benefits of a Waste to Energy Facility: generation of electricity, waste elimination, , avoidance of valuable city space.

- The trip to the University of Maryland may not be in line with the Clean Land Project, but it has been very beneficial, particularly for our LINAW Program. The experience shared by Dave Nemazie about the Chesapeake Bay Restoration Program opened my eyes to other possible approached with which we could adopt in the management of our wastewater program in Iloilo River, the Molo-Arevalo Foreshore, and the Tigum-Aganan Watershed Area. The different strategies of the program herein mentioned are adoptable

- Dr Alam's recommendation to encourage the 3 major oil depots located along Iloilo River to adopt ISO 14000 has made me aware the kind of potential toxic hazard that we faced in that area. "

Assistance in protecting the Iloilo province/straight from an Oil Spill near Guimaras to the South

In response to a request received from the Mayor of the Iloilo City Partner we looked into various options for protecting the Iloilo province and developed a plan and sent that to Iloilo within a day of the request. The following message from Subijoy Dutta accompanied the map/plan developed.

"..However, to protect the Iloilo water supply and to prevent the contamination from reaching inland here are a few suggestions:

1. *The most effective thing would be to place floating booms to keep the oil (which will always be on the water surface, top few inches) from entering the Iloilo river and the shore lines.*
2. *Also, absorbents can be lined up along the shore lines to absorb the floating oils*
3. *Pumps with Oil/Water separator should also be installed at critical areas. RE Wrights manufactures and sells those pumps in addition to Oil skimmers (http://www.oilskim.com) . You can try and contact them. If you have difficulty locating one let me know.*
4. *I have prepared a generic plan for locating the Booms and Oil/Water separators as attached in a satellite image. Depending upon the volume and location of the spill you can move the boom or shorten that to match your needs.*

……need."

– Iloilo Workshop and Training by the Maryland (US) Team, August 15-19, 2006

The schedule of activities for the August 2006 workshop and training is provided below:

Clean Land Cy 2005 Project
Workshop And Training, August 15-19, 2006

Schedule Of Activities

A. August 13, 2006 (Sunday)

11:55 PM; Manila Arrival; Gary Huffman, Manila Int'l Airport (NAIA), Cathay Pacific, Flight 905 from Hongkong

A. August 15, 2006 (Tuesday)

1. 1:20 PM; Manila Arrival Lilis Marwiani, Centennial Airport, Philippine Airlines

2. 3:05 PM; Departure, Manila- Iloilo; Gary & Lilis, Centennial Airport, Philippine Airlines
3. 7:30 PM, Welcome Dinner; Noel Hechanova, City ENRO and City Mayor Jerry P. Treñas, Chairperson, Iloilo City Solid Waste Management Board (ICSWMB)

B. August 16, 2006 (Wednesday)

1. Orientation at the City Mayor's Office (A.M.)

a) 8:30- 9:45 AM; Briefer - Iloilo City's Demography, Waste Characteristic, SLF Program Flow, Clean 2005 Project and Highlights of US visits; by Engr. Noel Hechanova, City ENR Officer
b) 9:45-10:45 AM; Highlights of 10-yr SWM Plan of Iloilo City; by Engr. Sotomil
c) 10:45-11:45AM; Iloilo City's Garbage Collection & Dumpsite Operation; by Engr: Gallo

2. Site Visit, Various Facilities (P.M.)

a) 2:00 -3:00 PM , visit to Calajunan Dumpsite, Mandurriao, Iloilo City; hosted by Engr. Gallo
b) 3:00 -5:00 PM, City Pilot Materials Recovery Facilities, to include the Pilot Hazardous Waste Collection Center; by Engr. Hechanova

C. August 17, 2006 (Thursday)

1. Workshop/Lecture at the City Budget Conference Room (A.M.)

Facilitator: Mr. Jose Roni SJ Peñalosa, City Planning Coordinator

a) 8:00 – 9:00 AM; Strategic Planning, Waste Minimization Option, Site Selection Criteria; by Gary Huffman
b) 9:00-10:00 A.M; Highlights of Iloilo City Sanitary Landfill Plan; by Engr Helen Sotomil
c) 10:00-11:00A.M. Highlights of SLF Plan Balikpapan City, Indonesia; by Lilis Marwiani
d) 11:00-12:00 P.M.; Developing "Green Products" for Construction; by Gary Huffman

2. Workshop/Lecture (P.M.)
Facilitator: Engr. Noel Z. Hechanova, City ENR Officer

a) 2:00-5:00 PM; Hospital Waste Management; by Gary Huffman

D. August 18, 2006 (Friday)

1. Visit to Local Attractions

E. August 19, 2006 (Saturday)

Gary Huffman and Lilis Marwiani departs Iloilo

A summary report and highlights from a few presentations during the above workshop is provided below.

<u>August 14, 2006</u>
According to the summary report from Gary Huffman, Maryland team member, the program got a head start with meetings in Manila on August 14 with Palingenesis Manufacturing. They manufacture two systems; one for the processing of municipal solid waste (MSW) and the second for infectious waste. Their MSW system consists of a shredder, screens, and a block making machine. Their shredder is very high capacity and raises the temperature sufficient to kill most bacteria. Consequently, the processed waste has no smell and looks very much like black potting soil.

In the Philippines, most of the MSW is between 85% and 95% organic materials including large quantities of moisture rich food and vegetable waste. Approximately 90% of the shredded MSW passes through their sieve to make a black soil material. This product can in fact be used as a potting soil or composted or it can be pressed into pellets as a coal substitute. Although the heat content of these pellets is 40% less than regular coal, these could be sold at 40% cheaper than the price of coal.

The remaining 10% of the waste above the sieve appeared to be mostly shredded plastics with some glass and a small amount of metals. This material was being dry cast into concrete

construction blocks. These blocks were made with cement and were not aesthetically pleasing. The blocks are manufactured to 175 PSI, which is about 25% of the load bearing requirement for construction blocks in the Philippines.

Infectious waste arrives in cardboard packages which are fed into the room and system on a conveyor. The shredder is much larger than the one used for MSW, operates at 300-400^{0}C and therefore requires water cooling of the bearings.

The cost of these systems is around $2 Million (USD) and is considered high and infeasible at this time for Iloilo. However, the Maryland team is looking into options for joining hands with this manufacturer and trying to combine one of the methodologies developed by EnviroProducts International, LLC (EPI) to conduct the solidification and binding system to bring down the cost of the system.

August 15, 2006

As planned earlier, Mrs. Lilis Marwiani, representative of the Balikpapan city partner met Gary Huffman, representing the MD team at the Manila Airport and flew together down to Iloilo city. Upon arrival they were met at the Iloilo Airport by Noel Hechanova, Helen Sotomil, and Queenie Siendo, representing the Iloilo City partner.

During the evening a dinner meeting was arranged by the City Mayor and Noel Hechanova where a number of local city officials were present.

August 16, 2006

An orientation meeting was held for the MD team and the Balikpapan city partner in a meeting room adjacent to Mayor Treñas' office. The following three presentations were made:

"The Iloilo City Solid Waste Management Program: Issues and Challenges" by Engineer Noel Hechanova
"Highlights of the Iloilo City 10 year SWM Plan" by Engineer Helen Sotomil
"Iloilo City's Garbage Collection & Dumpsite Operation" by Engineer Gallo
The discussions during these presentations were vigorous. Many different options and ideas for addressing the issues were discussed.

These presentations in the morning were followed by a site visit in the afternoon.
The first site visited was the Calajunan Landfill. In Gary Huffman's words "….frankly, I was not prepared to see a vertical mountain of uncovered garbage 40 feet high. There were goats and cows feeding on the waste. On top of one of the piles there were scavengers looking for recyclable materials to sell. I noted syringes and bandages indicating the presence of infectious waste. When I commented, the response was that they occasionally even see an arm or leg amputated by a local hospital. This was concerning because the workers were climbing over the waste in sandals with no socks. A small cut could be life threatening."

The Calajunan Dump site can be considered as a potential site to be mined as a resource. However, appropriate funding for one of the possible solutions within the social, political and economic constraints of Iloilo is a challenge.

Later the team visited three Barangays where the collection of recyclable and hazardous waste has been initiated. These Materials Recycling Facilities (MRF) were Buntatala, Bakhaw and St. Filomena. One collection center was so enthusiastic about the Program that they started as soon as their facility was ready, instead of waiting for an official opening. Another barangay initiated the receipt of Hazardous Waste ahead of schedule.

The enthusiasm and commitment of the volunteer workers were really quite impressive. They are getting out and talking to all the people in their barangay. Their stakeholders are in turn responding and supporting their efforts. The Iloilo City program has moved from "push" by the City to "pull" by the pilot barangays so that Noel Hechanova is being asked to provide support ahead of his planned schedule.

Noel Hechanova is constantly approaching the Mayor to support more waste initiatives. To date, the Mayor has supported each of Noel's requests, but the responsibility for conducting the proposed actions fall to Noel.

August 17, 2006

A meeting was arranged in the morning and afternoon at the Iloilo City center at the City Budget Conference room. In the morning there were between 15 and 20 attendees. In the afternoon Medical Session, there were 43 attendees. The attendees list reflects officials from the City health office, City environment and natural resources office, Technical workgroup members, local universities, many local hospitals, nursing homes, and NGOs.

The following presentations were made:

"Iloilo Goals, Objectives and Strategic Plan" by Gary N. Huffman for the MD team
"Highlights of the Iloilo City Sanitary Landfill Plan" by Helen Sotomil
"Highlights of the Sanitary Landfill Plan Balikpapan City, Indonesia" by Lilis Marwiani
"Balikpapan Goals, Objectives and Strategic Plan" by Gary N. Huffman for the MD Team
"EPI: A Technical Overview" by Gary N. Huffman, Chief Technical Officer, EnviroProducts International
"Medical Waste Management Options for Iloilo City, Philippines" by Gary N. Huffman for the MD team
"The Rapid Assessment" by Gary N. Huffman for the MD team

A few selected slides from the presentations are provided below:

Medical Waste Management Options for Iloilo City, Philippines

Gary N. Huffman
Ph: 303-359-9310; e-mail:
ghuffman@mho.com

Clean Land 2005, Maryland Team

Subijoy Dutta, P.E.
Ph: 410-721-7706; e-mail:
snmengineering@yahoo.com

Aerial view of the Iloilo River

Medical Waste Management Options for Iloilo City, Philippines

Medical Waste Minimization Options

KEY STRATEGIES INCLUDE:

- Segregation Of Waste Streams in Various Hospital Areas
  - Keep Non-Infectious Waste, such as papers, Soda cans and bottles separated. Have separate Bins for Infectious and Non-infectious Waste.
  - Provide "Visitor's Trash" - attractive Bins in Private Rooms, General Ward, and General Admittance Areas in addition to "Patient's Waste" Bins
  - Minimize Dilution Of Hazardous Wastes
  - Clearly Mark All Chemicals & Waste Containers
- MANAGEMENT & CONTROL PRACTICES
  - Centralize Purchasing And Dispensing Of Drugs & Hazardous Chemicals
  - Track /Monitor Drug & Chemical Flow Within The Facility
  - Conduct Periodic Waste Audits Of Each Dept. Generating Wastes And Apportion Waste Management Costs

Medical Waste Management Options for Iloilo City, Philippines

KEY FACTORS FOR EFFECTIVE MANAGEMENT & TREATMENT

- **GET THE PROPER WASTE TO THE TREATMENT – How?** Segregation
  - SOURCE SEPARATION USING SEPARATE CONTAINERS
  - MAY NEED TO EXCLUDE CERTAIN WASTES FROM STERILIZATION
  - SEPARATION OF LIQUIDS FOR INCINERATION/OTHER TREATMENTS
  - SEPARATION OF PVC MATERIALS FROM INCINERATION FEED
  - MINIMIZE PLASTICS AND GLASSES FROM INCINERATION FEED
- **ON-SITE VS. OFF-SITE CONSIDERATIONS**
  - AVAILABILITY OF EQUIPMENT ON -SITE & EASE OF INSTALLATION

Medical Waste Management Options for Iloilo City, Philippines

KEY FACTORS FOR EFFECTIVE TREATMENT

- **ON-SITE VS. OFF-SITE CONSIDERATIONS, Contd..**
  - ON-SITE -
    - ***ADVANTAGES*** :

      LOWER COST, CONTROL OVER WASTE, AND NO TRANSPORTATION NEEDS

  - ON-SITE -
    - ***DISADVANTAGES:***

      LACK OF TRAINED PERSONNEL, IMPROPER OPERATION, ADDITIONAL COST FOR INFRASTRUCTURE AND REGULATORY NEEDS RELATED TO WASTE OPERATIONS

Medical Waste Management Options for Iloilo City, Philippines

KEY FACTORS FOR EFFECTIVE TREATMENT

- **ON-SITE VS. OFF-SITE CONSIDERATIONS, Contd..**
  - » OFF-SITE -
    - – ***ADVANTAGES:***

      LESS INFRASTRUCTURE/PERSONNEL NEED FOR WASTE OPERATIONS, NO NEED TO CHECK OPERATIONAL CONDITIONS, REAP BENEFIT OF LARGE TREATMENT FACILITY OFF-SITE, FOCUS BETTER ON PRIMARY JOB, POOL RESOURCES TO GET BETTER EMISSION CONTROL EQUIPMENT.
    - – ***DISADVANTAGES:***

      TRANSPORTATION AND PACKAGING, LACK OF CONTROL ON WASTES.

Balikpapan City Objectives

Balikpapan Goals, Objectives and Strategic Plan

Major Tasks to Accomplish

- Consider the pros and cons of the Alternative Landfill Site based upon the Site Selection Criteria
  - – Make a final site selection decision
- Finalize the Strategic Plan for Municipal Solid Waste (MSW)
  - – Confirm with a letter of approval from local authorities

Gary N. Huffman for MD Team

The Strategic Plan

- Five main components
  - Vision: What the residents value
  - Goals: Qualitative statements that highlight key issues and add depth to the Vision
  - Objectives: Measurable steps toward the Goals
  - Actions: Specific tasks with timeframes and assigned responsibilities to achieve the Objectives
  - Implementation: How the Plan will be adopted and used with clear identification of authorities and responsibilities

Gary N. Huffman for MD Team

Iloilo City Goals, Objectives and Strategic Plan

Major Task to Accomplish

With the support of International Public-Private Partnerships:

- Establish/Setup Household Hazardous Waste Collection Centers
  - Initiate a Pilot Collection Program with starting date
- Setup a Medical Waste Segregation Program with Disposal Options
  - Initiate at one or two hospitals with starting date

Gary N. Huffman for MD Team

General Guidance

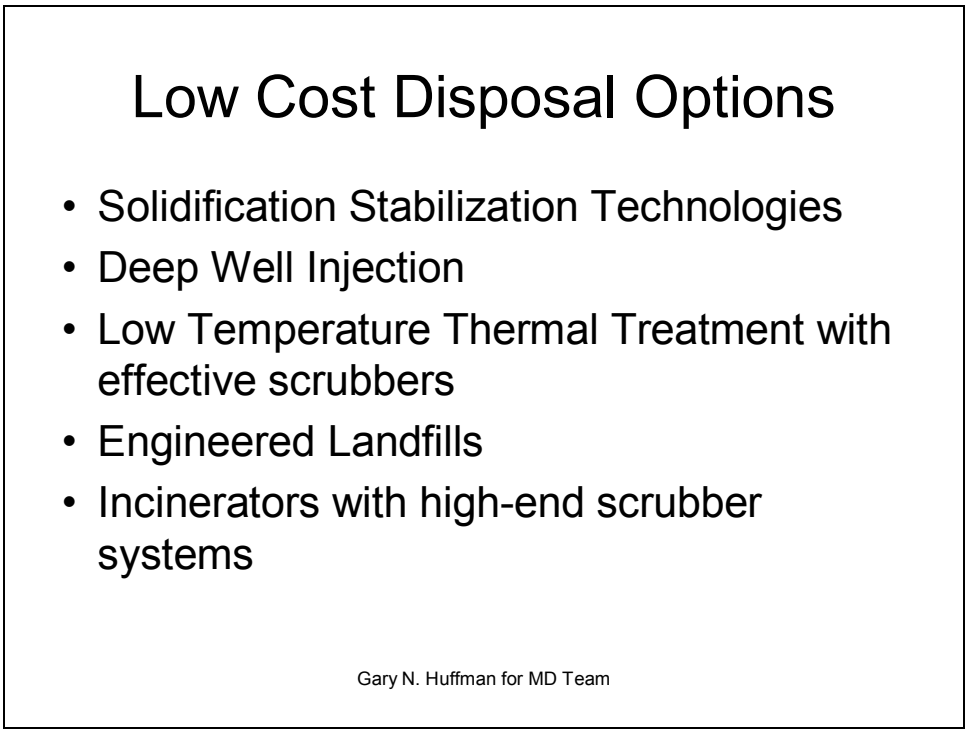
- Conduct an Extensive Outreach Program
  - Funding
  - Include the options of
    - Reduction
    - Reuse
    - Recycling and
    - Disposal
- Establish Hazardous Waste Collection Centers

Gary N. Huffman for MD Team

Outreach Components

- Permanent Collection or Exchange
- Special Collection Days
- Local Business Collection Sites
- Toxicity Reduction Education
  - Use of non-hazardous or less hazardous materials
  - Use only amounts needed and share the rest
  - Always follow directions and store safely

Gary N. Huffman for MD Team

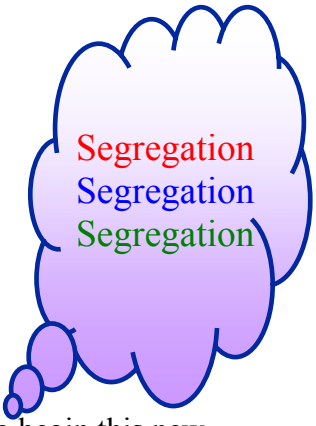


There were extensive discussions in both the sessions. There were a number of local issues discussed by the participants which called for collaboration between the various local agencies in resolving those issues. Relevant views and suggestion of the Maryland team was conveyed to our Iloilo and Balikpapan City partners the following morning at the breakfast meeting.

5. Specific Project Implementations by the City Partners

Iloilo City, Philippines

1. During the visit in August 2006 by the Maryland team was taken to three Barangays where the **collection of recyclable and hazardous waste has been initiated**. These Materials Recycling Facilities (MRF) were Buntatala, Bakhaw and St. Filomena. See Figure 16 for locations of the Pilot Hazardous waste collection centers. Planning and development of these centers was one of the Clean Land 2005 initiatives for Iloilo City. The Maryland team is really pleased to hear from our team member after the visit "..One collection center was so enthusiastic about the Program that they started as soon as their facility was ready, instead of waiting for an official opening. Another barangay initiated the receipt of Hazardous Waste ahead of schedule. The enthusiasm and commitment of the volunteer workers were really quite impressive. They are getting out and talking to all the people in their barangay. Their stakeholders are in turn responding and supporting their efforts. The Iloilo City program has moved from "push" by the City to "pull" by the pilot barangays so that Noel Hechanova is being asked to provide support ahead of his planned schedule.



2. A **Focus Group** on Medical waste was formed instantly during the workshop/discussion held in March 2006. Segregation of waste streams in various hospital areas was stressed by the Maryland Team. Also during the recent workshop on August 17, 2006 there were extensive discussions in both the sessions on Medical Waste. A number of local issues called for collaboration between the various local agencies in resolving those issues. The group planned to start proper medical waste segregation and disposal in a few Hospitals after they discuss the details of implementation in a few more meetings and select specific facilities to begin this new methodology. The following views and suggestions were provided by the Maryland team.
    a. Keep Non-Infectious Waste, such as papers, Soda cans and bottles separated. Have separate Bins for Infectious and Non-infectious Waste.
    b. Provide "Visitor's Trash" - attractive Bins in Private Rooms, General Ward, and General Admittance Areas in addition to "Patient's Waste" Bins

Figure 16. Locations of Pilot Hazardous Waste Collection Centers in Iloilo City, Philippines

Balikpapan, Indonesia

1. Considering the pros and cons of the Landfill site selection criteria developed for the city partner a comparative analysis of the Manggar site and the Taritip site, shown as site #5 and site #7 in Figure 11, was conducted by our city partner. A decision has been made by the local authorities there in favor of extending to the west side of the existing Manggar Landfill. The alternative site was economically infeasible and highly cost-intensive as reported by the city partner.

2. The initial strategic plan developed by the Maryland team was thoroughly discussed and studied by the local stakeholders and a revised strategic plan "Environmental Management By Citizen Partnership At Public Setlement". A number of stakeholders were involved in developing the plan including:
    - Environmental Ministry
    - Environmental Alimental Regional Office
    - Environmental Impact Assessment Balikpapan City
    - Cleaning, Gardening & Funeral Services
    - Elite figure
    - NGO
    - House Wife Team
    - Youth Club (Karang Taruna)
    - Solid Waste Worker
    - Religious community
    - Business corporate

Some of the representatives from the above stakeholder group are pictured on Figure 17 below.

The acceptable goal as revised through a number of meetings with the stakeholders is to:

a. Develop an environmental action plan which emphasizes risk-based analysis, good science, sound data, and open communication with informed participation to improve the environmental quality for proper urban settlement.

b. Improving awareness amongst communities and local people concerning proper environmental management.

c. Address the major solid and hazardous waste management concerns and participate, as appropriate, in a comprehensive program involving safe collection and disposal system for the solid and hazardous waste.

d. Finding mechanism / model in managing garbage and beginning with a pilot location

e. Integrating some activities of environmental management for proper urban settlement.

Figure 17. Balikpapan City Partner with a few Stakeholders along with the Maryland Team
(Photo: S. Dutta, March 10, 2006)

6. Potential Follow up Activities

The enthusiasm shown by our city partners in moving forward quickly and strongly in analyzing and tailoring the recommended plans and options developed by us to best-fit their local needs made this collaborative effort a great example of an effective exchange. All team members and partners of the Maryland team are really keen on extending further assistance to our City partners. From our observations during the project it seems that Iloilo City wants to make productive use of their municipal solid waste (MSW) by making solid blocks from their MSW. These blocks would be used for two purposes; the first is to form a wall around the landfill to keep waste pickers out and the second to allow for safe burial of the waste with contaminants well bound and not prone to leaching. These blocks could also be used for paving the sidewalks and in providing a stable ground cover for the landfill which would render them suitable for future commercial land use when closed. We will be looking into the three major issues in performing this task - the cost of the block making equipment, the cost of the polymer materials, and the structural requirements for the block. Some of these data have already collected by Gary Huffman of the Maryland team during the recent visit to Iloilo in August 2006. However, we are waiting on samples of shredded MSWs and some specific local fibers for testing the viability.

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