



TRAINING PROGRAM ON MUNICIPAL

“SOLID WASTE MANAGEMENT”

SEOUL, SOUTH KOREA

APRIL 9th - 13th, 2007



**Punjab Municipal Development Fund Company (PMDFC)
1-B, Dane Pur Road, G.O.R-I, Lahore**

1. Program Background

This training program was developed, as per request and guidance of the Urban Unit (UU) in GoPunjab, by KOICA and its consulting team and the World Bank that is providing technical assistance through funds of the Public-Private Infrastructure Advisory Facility (PPIAF). The World Bank (WB) is responding to the Pakistan Government's devolution and the urban development program on several fronts. KOICA was assisted by Korea Environment Institute (KEI) and Sudokwon Landfill Site Management Corp (SLC), both of which are among the key organizations of environmental management, and were founded by the Government of the Republic of Korea and the Korean Ministry of the Environment.

The Korea International Cooperation Agency (KOICA) has implemented several aid programs to assist developing countries. KOICA assistances programs encompass several activities to help them such as the Invitation of Trainees, Project Type Cooperation, Dispatch of Experts, and KOVs (Korea Overseas Volunteers). These activities allow Koreans to return the assistance that Korea received from the international community after the Korean War a half century ago, to recipient LDCs (Less Developed Countries) worldwide.

PMDFC has initiated Solid Waste Management (SWM) sub-projects in TMAs Chiniot, Daska and Mailsi through PMSIP. One of the important key capacity interventions of Punjab Municipal Services Improvement Project (PMSIP) is trainings of TMA staff to enhance skills needed to perform at optimum standards. Therefore, PMDFC arranged trainings for TMA staff who would be involved in SWM in the respective TMAs where SWM projects are being financed through PMSIP.

First part of the subject training was held in Lahore from 15-18 January, 2007. The training was conducted with the help of Korean International Cooperation Agency (KOICA). Training covered all aspects of SWM. The second phase of the training was held in Seoul from 9th -13th of April 2007. This training in Seoul was focused on practical knowledge transfer with lectures and field trips of SWM facilities in Korea, which are one of the biggest SWM facilities in the world. It is expected that participants in the training program are officials that have worked closely with SWM in the TMAs and would continue to do so after the training.

2. Training Methodology

This training workshop focused on the transfer of practical knowledge and technology that has been developed in recent decades in Korea. The plan of training was a mixture of lectures and the field studies, including visits of the SWM facilities, collecting and other relevant sites constructed and operated by not only the SLC (Sudokwon Landfill Management Corp) as well as other SWM facilities in Seoul.

Eight lectures were given on topics that were not addressed in the first phase of training. The topics were *waste treatment related, including industrial and hospital waste management, economic aspects of SWM, EIA of SWM projects, public relations practices of solid waste policies, and a SWM case study of Seoul, etc.*

Participants explored SWM theories and practices in a classroom setting as well as at solid waste related facilities. The most important site that the participants visited was the solid waste treatment facility operated by SLC (Sudokwon Landfill Management Corp); one of the biggest SWM facilities in the world.

3. Training Participants

Training participants for the Phase II of training in Seoul, South Korea were selected in considering relevance SWM sub-projects initiated in the three TMAs and PMDFC staff who were involved in SWM sub-projects. PMDFC/TMA training participants in the training at Seoul, South Korea were:

1. Ch Muhammad Ashraf, TMO Mailsi
2. Mr. Naeem Ahmed Awan, CO Mailsi
3. Syed Jamil Safder Shah, CO, Daska
4. M. A. Chaudhary Saeed, TMO Chiniot
5. Mr. Zafar Iqbal, Sub-Engineer Chiniot
6. Mr. Iftikhar Rasool,, GM Engineering PMDFC
7. Mr. Talal Ahmad Khan, Manager (ID) PMDFC
8. Mr. Nabeel Haider, Dept Manager Env. PMDFC

4. Important field visits

Visit of Recyclable Resource Sorting Plant in Gwang Myeong City

The trainees visited the site that has a capacity of sorting 100 ton/day. After a formal presentation the trainees visited several sections of the plant such as: Waste depository, sorting area, electromagnetic area, compressor, Yogurt bottle separation etc. During the visit it was told by the plant management that compressed waste packs are even exported to China and other places. Left over waste after sorting out for recycling was sent to landfill sites. It was a valuable experience for the trainees as most of them saw formal waste sorting plant for the first time. Since 1995, Seoul Metropolitan Government has enforced a user charge system to manage effectively solid wastes problems for the city. The user charge policy has greatly contributed to raise recyclables from wastes, and to reduce wastes which ought to be land filled or incinerated.

Visit of Sunjin Engineering & Architecture Office in Seoul

The training team visited office of *Sunjin Engineering & Architecture* in Seoul. Sunjin Engineering has designed Sudokwon Landfill Site. They were greeted by company president & CEO Dong-Joo Kim. A presentation about company's achievements was given to the team. During the presentation it was told that Sunjin is apart from its peers in Korea and around the globe through provision of "One stop Total Integrated Solutions" covering all areas of civil engineering and architecture. It was further shown how Sunjin had signed contracts with major projects around the world.

Visit of Waste Gathering and Collecting Site at an Apartment complex in KyungSeo-Dong, Incheon

Participants visited an apartment complex to see how residents handle municipal waste. They were taken to some sheds that were serving as collection centres of wastes for the apartment complex. The residents had formed a cooperative society that operated those centres. The segregated wastes were sold resellers. The money thus collected is being spent by the cooperated society on the apartment complexes. Operations of such centers were carried out by volunteers from the apartments. This system ensures recycling of municipal wastes as well as spell out spirit of cooperation between residents.

Visit to a Transfer Station, Incheon city

Participants visited a solid waste transfer station in Incheon city. It was told that waste from different small cities was brought to this transfer station by small trucks. It was re-loaded in larger trucks and shifted to Sudokwon landfill site for final disposal. Operations of the transfer stations were explained by the management of the site. It was further told that the amount of solid waste brought to that transfer Station had decreased after the start of operation of a large incineration plant nearby. Thus, Seoul had started minimizing the amount of solid waste for landfill.

Visit of Sudokwon Landfill Site

'SUDOKWON Landfill Site' which is located in west coast, 30km away from the Seoul limits. Seoul city and neighbor local governments including Incheon city and some cities of Kyonggi province are sharing this landfill.

Visit to the world's largest landfill site provided the participants with insight into most advanced landfill site operations. The landfill site has an area of 3,300,000 m² and has a capacity of 67,000,000 m³. The onsite study tour included visits to Leacheate Collection system, 50 MW electricity generation plant, landfill gas collection system, Botanical garden, landscape area and finally daily solid waste dumping operations. Participants were also briefed how this large landfill site would ultimately be converted into a modern dream park.

Visit to Olympic Stadium, Nynjeng

On the final day, a visit to the Olympic Stadium, Nynjeng was undertaken. A presentation on how this environmentally hazard solid waste dump was converted into a world class stadium was shown. The site also holds an annual event where million people gather to celebrate this miraculous achievement by the Korean people.

Other Field Visits

Other field visits included visit to sewerage treatment plant, Visit to Daewoo car plant, visit to KBS TV station, and visit to a Motor Car show. All these visits were testament of South Korean remarkable technological growth that has transformed this war destroyed nation as one of the leading nation in the world.

5. Benefits of the Course

Primarily, the training workshop was a show case for the participants to witness one of the best solid waste management practices in the world. More importantly, the experience was obtained from a country that had similar problems of SWM

as Pakistan few years back. The successful model could be followed to improve SWM condition in Pakistan. Highly innovative, the South Koreans combined technological, economic and persuasive measures to address the underlying impacts brought by the continuous proliferation of solid waste. The strategies they have employed include rigorous awareness campaigns, community recycling activities and composting, incineration, segregation of infectious and human waste management, using large landfills to serve several communities that pool their resources to operate large SWM structures. Income generating activities have also flourished among local communities and institutions in the municipality through voluntary waste segregation, collection and recycling.

The study tour successfully demonstrated how the South Koreans have successfully transformed SWM regime from one of disposal to avoidance. Waste minimization concept has crept in their daily lives. Land filling is used as a last resort to save this valuable asset. Recycled materials are not only used in local industry but are also exported. Energy is being produced from large landfill facilities to cater the needs of community. Recreational facilities are planned after the closer of such large landfills sites. Regulations are made by the government on regular pattern to facilitate SWM needs. Civil societies play an important role in developing the regulations and for the education of citizens to abide by such regulations.

The visit to South Korea provided the participants with an opportunity to observe and admire Korean society. It was quiet obvious that Koreans are very gracious and warm people. From casual greetings, to visits, to table manners they do have a list of do's and don'ts for people to follow. For example showing respect to elders is considered as a very important part of the etiquette in South Korea. Also, Koreans love their food and are very proud of their traditional food. A typical Korean meal includes a variety of dishes. Among the dishes of the country 'kimchi' is the most popular one. The participants were invited to several lunches

and dinners at top authentic restaurants. Farewell dinner at the famous Seoul tower revolving restaurant at Mt. Namsan would be remembered for along time.

Annex A

Training Program Schedule

The specific schedule of the program day by day was as follows:

Period: ***April 9th to 13th , 2007***

| | Event | Contents | Notes |
|-------|--------------|--|---|
| Day 1 | 1 | Welcoming Ceremony by Ministry of Environment, KOICA, KEI, SLC | Public Information Center, SCL |
| | 2 | Orientation - Introduction to KOICA & Korean culture - Introduction to SLC | Public Information Center, SCL |
| | 3 | Lecture 1 : Technology and policies of Industrial & Hospital Waste Management | Prof. Kim, Seung Do (Hallym Univ.) |
| | 4 | Lecture 2 : Policy Direction for Sustainable Waste Management | Dr. Yoo, Myung Soo (Ministry of Environment) |

| | Event | Contents | Notes |
|-------|--------------|--|---|
| Day 2 | 1 | Lecture 3: Economics of Waste Collection Fees & Waste Management Budget | Prof. Park, June Woo (Sangmyung Univ.) |
| | 2 | Lecture 4 : Privatization of Waste Collection & Treatment Services | Dr. Moon, Hyun Joo (KEI) |
| | 3 | Visit of Recyclable Resource Sorting Plant in Gwang Myeoung City | Recycle Facility |
| | 4 | Visit of SBS Head office in Seoul | |
| | 5 | Visit of Main Office of Sunjin Engineering & Architecture in Seoul | |

| | Event | Contents | Notes |
|-------|--------------|---|----------------------------|
| Day 3 | 1 | Lecture 5: Environmental Impact Assessment of Waste Management Projects | Dr. Lee, Seung Hoon (KEI) |
| | 2 | Lecture 6 : Policies for Sustainable Resource Management in Korea | Dr. Lee, Sang Hun (ENVICO) |
| | 3 | Visit of GM Daewoo Manufacturing Plant | Advanced Industrial Plant |
| | 4 | Visit of SeungGi Water Quality Control Office in Incheon City | Sewage Treatment Facility |

| | Event | Contents | Notes |
|-------|--------------|--|--|
| Day 4 | 1 | Lecture 7 : Solid Waste Management in Seoul | Dr. Yoo, Kee Young (Seoul Development Institute) |
| | 2 | Lecture 8 : Procedure for Landfill Site Selection | Prof. Kim, Byung Tae (Daejin Univ.) |
| | 3 | Visit of Waste Gathering and Collecting Site at an Apartment in KyungSeo-Dong, Incheon | Collection System |
| | 4 | Visit of Sudokwon Landfill Site | Landfill |

| | Event | Contents | Notes |
|-------|--------------|--|-----------------------------------|
| Day 5 | 1 | Visit of Mapo Resource Recovery Facility & The Resources Recycling Theme Exhibition Hall | Incineration & Recycling of Waste |
| | 2 | Visit of Restored Landfill sites: Haneul & Noeul Parks | Transition of Nanji |
| | 3 | Tour of Downtown Seoul (Traditional Street, Market, etc.) | |
| | 4 | Farewell Banquet | Seoul Tower |

Annex B

Brief Outline of Lectures

a. Technology and Policies of Industrial & Hospital Waste Management

Prof. Seung Do KIM, Ha/lym University

This lecture covered the technology of industrial and hospital waste management, and outlined Korea's current practices in these areas. Industrial waste is recycled into raw materials in Korea. Recycling of inorganic industrial waste sustains economic competitiveness because of higher purity of wastes and low pre-treatment costs. On the other hand, incineration is responsible for treating organic industrial waste comprised of plastics and papers, etc. Incineration residues (ashes) and inorganic waste that cannot be recycled are landfilled. Hospital waste is classified into hazardous waste, and is tracked electronically from generation to treatment. It is incinerated in an environmentally friendly manner.

The policies in place regarding the management of industrial and hospital wastes are designed: 1) to reduce the amount of wastes generated; 2) to recycle the wastes as much as possible; 3) to treat the non-recyclables in an environmentally sound manner; and 4) to achieve "Waste Management in a Closed Loop of Resources." In order to control to dump hospital wastes into the environments, it should be emphasized on monitoring the waste flow of the hazardous waste from generation to final treatment.

b. Policy Direction for Sustainable Waste Management

Dr. Myung Soo roo, Ministry of Environment

This presentation dealt with policy direction regarding sustainable waste management in South Korea. It consisted of four parts. Part I introduced global environmental regulations and policy trends. Part II illustrated waste generation and treatment trends in South Korea. Household and industrial waste generation, landfill, incineration and recycling rates were explained briefly. Part III introduced waste management goals and strategies, including backgrounds and 2011 target rates for landfill, incineration and recycling. Lastly, major waste management policies such as the Volume-Based Waste Fee System and Extended Producer Responsibility were addressed.

c. Economics of Waste Collection Fee and Waste Management Budget

Prof June Woo PARK, Sangmyung University

The introduction of the Waste Fee System has differing reactions from residents depending on the rate of fee that is decided upon. Consumers are very wary of their economic burden relating their waste discharge and sensitive to how the collection fee is decided.

Under the fixed rate system consumers are not aware of waste costs and have no intention to control the volume of waste, since the collection fee is decided independent of the volume of waste that is produced. Consumers, however, have incentives to reduce their waste volume under the Volume-based Waste Fee System which imposes a differentiated collection cost as determined by the amount of waste generated by each resident. In this lecture the volume-based waste fee system was studied as a very effective and efficient policy tool to foster source reduction of waste.

Before analyzing the system, its historical background was reviewed focusing on the paradigm shift in waste policies in Korea: from government sole responsibility to shared responsibility among government, producers and consumers; from

supply-centered policies of expanding treatment capacity to demand-control policies emphasizing reduction, reuse and recycling.

d. Privatization of Waste Collection & Treatment Services

Dr. Hyun Joo MOON, Korea Environment Institute

Private sector participation in waste collection and treatment services is one of the policy options which enable governments to utilize private capital in the construction of treatment facilities and improve efficiency of operation.

This lecture introduced the main ideas of private sector participation in waste collection and treatment services: i) the purpose of private sector participation in waste collection and treatment services; ii) the types of private sector participation and factors therein; iii) the process of private sector participation. This section dealt with the Korean experience and keys to success in the privatization of SWM. Then we discussed the necessity and effectiveness of privatization in encouraging infrastructure establishment and improving the efficiency of waste services. Lastly, the lecture introduced an effective implementation framework for successful privatization in waste collection and treatment services.

e. Environmental Impact Assessment of Waste Management Projects

Dr. Seung Hoon LEE, Korea Environment Institute

With an increased awareness of the environment in societies, the effective management of waste is gaining much attention from the media, government bodies and the general public. Although waste must be accommodated at nearby management facilities, unfortunately there exists a widespread Not in My Backyard (NIMBY) syndrome.

To help counter these attitudes the Environmental Impact Assessment (EIA) is an environmental management tool aimed at identifying environmental problems

and available solutions that would minimize their impacts to publicly acceptable levels. It also functions as an environmental management plan, which includes a monitoring program to address potential problems early in the project's planning and design phase.

In this lecture on fundamental EIA studies for waste management projects, the aim was to formulate a clearer picture on environmental impacts which might occur as a consequence of pursuing a development project.

f. Policies for Sustainable Resources Management in the Republic of Korea

Dr. Sang Hun LEE, Korea Environment & Resources Corporation

This lecture aimed to give an overall introduction to the various policies related to sustainable resource management in Korea focusing on waste management. The ultimate goals of waste management are to provide a clean environment for people and the natural ecosystem by minimizing waste generation, optimizing waste recycling and treating waste in environmentally sound manner. A strategic approach to promoting the "3R's" (Reduce, Reuse, and Recycle) is the core measure to achieve those goals in Korea. The 3R approach contains many successful policies such as the "volume-based waste fee system", "food waste reduction", "electronic waste manifest system", etc. Necessary factors for the success of these policy implementations were discussed.

A core player is the waste recycling policy of Korea in the Korea Environment & Resources Cooperation. Established in 1980 and renamed as the current one, the cooperation has performed collecting and processing tasks for such items as plastics, and waste steel. Nowadays it has opened the cyber recycling market to facilitate waste materials traded between companies.

g. Solid Waste Management in Seoul

*Dr. Kee Young YOO, Seoul Development
Institute*

The population of Seoul has tripled in about three decades, from 3.5 million in 1965 to 10.3 million in 2004, accounting for around 21 percent of the total population. The population density is 16,994 persons per square kilometer, which is relatively high compared to other worldwide metropolitan cities.

The former means that Seoul inevitably generates a large amount of waste; actually reaching up to about 11,000 tons of waste per day. On the other hand, the latter implies that the placement of a waste treatment facility within its border is not easy. Practically,

Seoul uses a landfill site as a prerequisite method for waste management, but is located in Kyonggi Province. However Seoul has developed its system suitable for social and physical circumstances.

This lecture was intended to introduce Seoul's waste management system, by reviewing five aspects of it: 1) What is Seoul?; 2) What are the guiding principles for solid waste management?; 3) How are Seoul's wastes classified for pertinent treatment?; 4) Where are wastes flowing through in Seoul?; 5) What kinds of equipment or facilities are used?; and 6) What is Seoul pursuing in order to create a nicer city?

h. Procedure for Waste Landfill Site Selection

Prof Byung Tae KIM, Daejin University

Landfilling is the most cost-effective among the many waste treatment methods.

Recently constructed landfills are designed so that waste is disposed of in the most environmentally-sound and sanitary way possible. The whole procedure to build a new sanitary landfill includes planning, site selection, design and construction, operation, closure and post closure care.

This lecture focused on the procedure of landfill site selection; which is the most critical step in the process of establishing a landfill facility. The goal of the landfill site selection process is to ensure that the landfill facility is located at the best location possible with as little negative impact as possible to the environment. For the selection of the best landfill site, a substantial evaluation process at every sub-step in the procedure of site selection is needed to identify the available sites which meet the regulations and the socio-economic, environmental, public acceptance, and geological criteria. In this lecture, the detailed procedure and criteria for landfill site selection in many countries, as well as evaluation methodologies, were introduced.