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FINAL REPORT

of the CDG/AIT Seminar  
"Solid Waste Management"

25 - 30 September 1978 - Bangkok, Thailand

Prepared by: Günter Tharun

72CDG78-624

PREFACE

The Carl Duisberg Gesellschaft has, for its first Seminar on environmental protection, focussed on the subject of Solid Waste Management. The Seminar was designed for technical and managerial personnel, from eight east and south-east Asian countries, who are specifically concerned with this subject. It was carried out on behalf and with the kind support of the Federal Ministry for Economic Cooperation.

The preparation, planning, organization, execution and assessment involved close cooperation between the Environmental Engineering Division of the Asian Institute of Technology (AIT), Bangkok, the Federal Environment Agency, Berlin and Environmental Resources Ltd, London.

All those involved, especially the Seminar participants themselves, are hereby thanked for their great interest, continual commitment and effective work.

G. Tharun  
Cologne, July 1979

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1.

INTRODUCTION

It is not only in the industrialized countries that high population densities and extensive industrialization associated with increasing economic growth have led to a rapid increase in consumption of available resources, through which our environment has been, and is being, often impaired.

In developing countries, the impairment of those natural environmental conditions essential to life, such as clean air and water and fertile soil, tends to be much more serious than in the western or eastern industrial societies because of the very rapid increase in population, unceasing urban migration and the associated, largely uncontrollable, problems of over-population and sprawl of large cities on the one hand, and growing industrialization in these urban centres on the other. Generally speaking, except in a few countries on the verge of becoming developed, those responsible for environmental protection in developing countries lack the necessary financial and administrative means to be able to better overcome the problems they face.

As man, to ensure his existence, not only continually consumes resources but also produces, besides the desired products, certain by-products in the form of wastes that are not immediately usable, he adversely affects his environment in two ways by the same process: firstly, by the manufacture of products and generation of wastes and secondly, by disposing of wastes. In a finite environment, the greater the density of population and industrialization, the more these adverse environmental aspects of human activity become a management problem.

As in most developing countries problems of environmental pollution, contrary to some pre-conceptions, occur in a more acute form, we resolved to initiate further training activities in the area of environmental pollution. Although the subject of water protection and effluent disposal is without doubt afforded the highest priority for developing countries, we have ventured initially on the basis of a Management Seminar for technical and managerial personnel concerned with solid waste management. On the one hand, this area has, in the past, not been taken much into account and, on the other, we can distinguish the main problems of waste handling and disposal as being essentially those of management. Therein lay our decision to embark on the theme of "Solid Waste Management".

2. OBJECTIVES

This technical seminar aimed primarily to provide participants from south-east and east Asian countries with a deeper understanding of the available techniques and methods for waste management planning, and to enable them to reach appropriate decisions in respect of their particular national or local waste management problems. This applied both with respect to the reliability and also the cost-effectiveness of the systems employed for the collection, transport, treatment and final disposal of wastes from households, commerce and industry.

While, on the one hand, the current status of techniques, i.e. the alternative methods and technologies for waste management in western industrialized countries, was to be presented and examined critically for its transferability and adaptability to the specific problems of developing countries, particular attention had also to be given to the specific waste management problems of the participants' countries.

In order to achieve these objectives, a most intensive and open exchange of experience and information needed to be encouraged, which represented an objective in itself.

Beyond these purely technical objectives, two institutional goals were sought from our side with this Waste Management Seminar. Firstly, the cooperation built up and extended since 1975 with AIT should be both expanded and consolidated through this first joint Seminar; secondly, on our side, this Waste Management Seminar was construed as a pilot project for the newly-introduced area of environmental protection within our activities.

Generally, it must be stressed that, for us, the most important criteria at every stage in the realization of this Seminar were the practicality and relevance to problem-solving for the participants in this specialized meeting.

3. TARGET GROUP

The Seminar was aimed at technical and managerial personnel in the field of waste management from Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand. The participants had all completed academic training in natural or engineering science subjects and held higher positions of responsibility, usually with several years of practical experience.

4. PROGRAMME CONTENTS

The Waste Management Seminar addressed itself to the following main themes:

- operational factors and economic analysis in planning and decision-making for waste management;
- alternative technologies for collection and transport, handling including recovery, and disposal of household refuse and industrial wastes;
- exchange of professional experience in the field of waste management and resource recovery between Asian and West European specialists.

5. PROGRAMME STRUCTURE

With regard to this Seminar, three phases may be broadly distinguished. In the first phase, participants were sent documents, for their own individual preparation and information, some weeks before the start of the Seminar. Here, the most important source of information was a 225-page compendium, entitled "Background Material", covering all the essential aspects of waste management, which we commissioned ERL to put together from selected technical articles for the purpose of guiding the preparation of participants. At the same time, this sought to ensure that all participants were more or less equally informed and that, through the advanced presentation of information on technological questions, more time was gained during the Seminar for presenting and discussing the somewhat more interesting aspects of waste management. An overview of these contributions may be gained from Appendix 7.5. Besides this, participants each received via the German Embassies, four NATO-CCMS research reports on hazardous wastes, as well as a brochure from the relevant sectors of German industry which contained details of plant and equipment for environmental protection and their manufacturers.

In addition, a report on the "Economics of Recycling" was distributed to the participants at the beginning of the Seminar. Sixteen expert papers served as working documents, some very detailed, which were specifically tailored to the individual components of the Seminar and arranged variously into a Seminar volume. A summary of these is also given in Appendix 7.5.

A further Seminar volume contained the reports contributed in advance by the participants themselves about their specific experiences of waste management in their home countries, which not only provided the organizer and the other partners with further first-hand information to assist with the orientation and control of the Seminar to meet the needs of participants, but also served to facilitate the interregional exchange of experience between the participants.

Nevertheless, the key feature and highpoint of the Seminar consisted of the 30-page case study developed by ERL: "Examination of Disposal Options for the Rowanna Sub-Region", on which the participants themselves worked in six working groups, each with a different set of constraints, and were able to exercise their skill and understanding of the analysis of the problems to develop realistic solutions and a suitable action programme. The case worked upon was fictitious, but nevertheless geared to typical waste management situations in countries of the South-East Asian Region, and therefore was designed and prepared with a close bearing to reality.

Besides the technical papers and discussions and the work on the case study, a half-day excursion to one of Bangkok's four composting plants was conducted, during which, through practical observation and instruction, it could be demonstrated how composting as a possible recovery technology should not be approached, as no customers existed for the compost.

For the follow-up phase, there are several activities possible which we should handle flexibly.

The most important follow-up measure will undoubtedly be the next Waste Management Seminar, which will be held at AIT from 10 - 17.12.1979 for participants from the same developing countries as for the previous one in 1978. This next Seminar will not only utilise the experience of the first, but will rather employ the results and what has been achieved to date for the purpose of further developing practical solutions for the waste management problems and situations of the Asian countries concerned. Consequently, less time is envisaged for expert lectures but much more time will be devoted to detailed technical discussions and work on case studies. Moreover, the specific problems and regional conditions and constraints with respect to waste management in east and south-east Asia will be considered more extensively. In contrast to the previous Seminar, an overall case study will form the structure of the entire Seminar, so that detailed data and information on the social, economic, infrastructural, topographic, climatic, hydrogeological and administrative conditions for a hypothetical example of a region

within a developing country can be presented, and critically reviewed and discussed. With the aid of four sub-case studies, an understanding and an ability for developing cost-effective and environmentally-appropriate solutions to problems shall be imparted and practised as effectively as possible. The participants should then be in the position not only to know the essential components of a Waste Management Master Plan but to have such a command of the process of formulating an appropriate strategy that this can be successfully transposed by them. Because of several inquiries, it was arranged by us that the trip of Herr Goosmann (UBA), who took part on our behalf in the APO-Symposium "Environmental Engineering", could include short stays in Manila and Taipei in order to meet with former participants and other professional people involved in waste management and to advise on their problems. Further information on this may be gained from the trip report contained in Appendix 7.6. In the meantime, AIT, ERL and UBA have engaged in a fairly intensive exchange of technical information and ideas with individual participants aimed at solving some of their problems.

The relevant departments of GTZ were extensively informed by us about the progress and results of our first Waste Management Seminar, in order that the knowledge gained may be used for project work. So for example, the positive experience to date of Taiwan with the industrial utilisation of bauxite sludges (red mud) could offer a starting point for GTZ for cooperation in the realisation of analogous projects in Central America.

As the Seminar had found an extremely positive response amongst both the participants and the relevant institutions in the Region, it was agreed with AIT to revise, edit and publish the Seminar papers, to enable them to be made available to a much wider technical audience. The Environmental Engineering Division of AIT was entrusted with this task and will be able to complete the work by the middle of 1979.

## 6. RESULTS

### 6.1 Assessment by Seminar participants

At the end of the Seminar, the participants were asked to fill out two questionnaires. Whereas one served to collect further information about waste management in the respective developing countries, the other was aimed particularly at enabling the evaluation of the Seminar, and also at providing guidance for setting the focal points of future Seminars, and information on the priority needs for training in the area of waste management. Copies of both questionnaires are presented in Appendix 7.3.



The evaluation questionnaire contains four groups of questions:

- a. the assessment of the Seminar contents and documents, its organization and execution, by the participants, and their general impression;
- b. information as to the most, and least, interesting parts of the Seminar;
- c. proposals regarding Seminar contents which should be considered in any follow-up Seminar;
- d. information on training needs for waste management, to identify criteria for planning future activities in this area.

A summary of the most important answers and comments is contained in Appendix 7.4.

In general, the participants gave a decidedly good opinion of the Seminar. In particular, they praised the choice of themes, the efficiency of organization and the Seminar material provided. Over 80% of the participants were of the opinion that, for them, the group work on the case study represented by far the most interesting and stimulating part of the Seminar.

Criticism was expressed primarily at the lack of time owing to the perhaps too severe planning of the Seminar. The general view showed that perhaps too much was dealt with in too short a time and therefore insufficient time remained for the case study and for the exchange of experience between participants, even though approximately half of the available time was reserved for this. A further criticism was that the lectures were not accompanied by enough visual aids to assist comprehension.

Nevertheless, the participants' answers showed that they considered the Seminar to be timely and very valuable. Many participants expressed the opinion at the end of the Seminar that they now could see themselves better able to reach the right decisions for their own circumstances regarding waste management.

The responses to the question regarding the focal points of a future Seminar indicate a particularly strong interest in the themes: planning and decision-making, resource recovery, organization and management, legislation and regulation, hazardous wastes, economic analysis, and collection and transport.

In general, training courses for technical personnel with operating experience are called for, particularly one to three month training programmes on technical processes.

## 6.2 Cooperation of the partners involved

Apart from the Chairman of the Environmental Engineering Division of AIT, Professor Dr N.C. Thanh, three further lecturers contributed to the preparation and execution of the Seminar while, on the German side, two senior staff of the waste management division of the Federal Environment Agency (UBA) took part. Likewise, Environmental Resources Limited had delegated two senior personnel as lecturers, as they in particular had worked out and prepared at our behest the most important background material, and around half of the Seminar papers (excluding the country reports of participants) as well as the case study.

From our side, the technical direction was entrusted to one of the two lecturers made available by UBA, Herr Goosmann. The author of this report, as the director of the Seminar, was responsible for the general preparation, planning, organization, execution and evaluation. Consequently, the programme management was undertaken by the Asia Section of CDG.

Several of the partners played a substantial part in the preparation and conduction of the Seminar, and the cooperation achieved must be rated as exceptionally helpful and productive. Viewed generally, it could hardly have proceeded better, especially as the Environmental Engineering Division of AIT had taken great care to ensure the smooth running of the Seminar, through the tireless effort of the staff, students and assistants.

In view of the very positive experience in cooperating with the Environmental Engineering Division of AIT, substantial savings in costs can be achieved with future Seminars; so, for example, Seminar volumes of like quality can be locally produced much more cheaply. Similarly, the Seminar papers can be reproduced there in the desired form. In both instances, the very high transport costs from Europe to Bangkok may be avoided, which is to be borne in mind for subsequent occasions.

## 6.3 General assessment

As is apparent from the foregoing commentary, the objectives of the Seminar were achieved to a greater extent than could have originally been expected. The Seminar was implemented by us, in close cooperation with relevant technical institutions, at the appropriate time and with the right approach for solving the practical problems of waste management in developing countries

of east and south-east Asia. Particular interest in the Region was generated not only by the subject-matter, but more by the fact that the Carl Duisberg Gesellschaft, as one of the first to enter this increasingly important, but long-neglected branch of environmental protection in developing countries, is active in trying to solve as effectively as possible their training problems, and so overall to make a substantial medium-to-long term contribution to improving their situation regarding waste management.

That the precarious step into a virgin area of educational aid proved to be appropriate, is impressively confirmed not only by the very positive response on the part of the Asian participants, who worked with exceptional interest and diligence in every phase of the Seminar, but also by the great interest since generated both in Germany and at the international level. From this one may conclude that not only has awareness of the environment substantially increased in developing countries but also that practical approaches to solving problems are especially sought after.

In general, the first Waste Management Seminar of CDG can be regarded as a successful pilot project in an increasingly important, and for us still new, technical field.

In any case, this successful start should be systematically followed up and extended by suitable actions. It would be in the first instance a political decision to give clear indications in this respect and to concentrate and extend, if possible at AIT, the German environmental protection activities in the education sector, especially as the perception grows worldwide that, through practical and problem-oriented regional seminars, developing countries can be rapidly and cost-effectively assisted.

APPENDICES

LIST OF THE PARTICIPANTS

HONGKONG

1. Mr. Anthony K. A. de Fleury  
Environment Branch, Government Secretariat  
Central Govt. Offices, Lower Albert Rd.  
Hong Kong
2. Mr. R. T. Jenkins  
c/o Electrical & Mechanical Office Public Works Dep.  
Hong Kong
3. Mr. Wong, Mang-ki  
c/o Civil Eng. Office, Public Works Dept.  
Murray Building, Garden Road  
Hong Kong

INDONESIA

1. Mr. Nono A. Aboeprajitno  
Urban & Environmental Research Center  
Capital City Jakarta  
Jl. Merdeka Selatan 8-9 22nd Floor
2. Mr. Wahyu Santoso  
c/o Government of Capital City  
(Urban & Environment Research Center)

KOREA

1. Mr. Kim, Kyu Eung  
c/o Ministry of Health and Social Affairs, Seoul
2. Mr. Kim, Kyong Ho  
c/o Ministry of Health and Social Affairs

MALAYSIA

1. Mr. Quah Choon Huat  
c/o Majlis Perbandaran Kelang  
Kelang, Selangor
2. Mr. Thomas Gan Eng Siew  
c/o Majlis Perbandaran Pulau Pinang
3. Dr. V. Sivapalasundram  
c/o Municipality of Petaling Jaya

4. Mr. Mohd. Sidek B. Mandeh Sha  
Municipality of Ipoh, Ipoh

PHILIPPINES

1. Mrs. Evangeline V. Tablante  
c/o Ref. & Environmental Sanitation Centre  
Metro Manila Commission Cpd, Quezon City
2. Mr. Pedro P. Viray  
c/o National Pollution Control Commission  
772 P. Gil Street, Ermita, Metro Manila
3. Mr. Sixto E. Tolentino, Jr.  
31 North Rd., Cubao, Quezon City  
Metro Manila
4. Mrs. Pollyana J. Seña  
c/o National Environmental Protection Council,  
6th Floor, Philippine Heart Center for Asia Bldg.  
East Avenue, Quezon City
5. Atty Jose B. Perez  
c/o Metropolitan Manila  
Commission Refuse & Environmental Sanitation Center  
RESC  
MMC Compount Quezon City
6. Mr. Jose H. Espiritu  
c/o Bureau of Public Works, MPWTC  
Bonifacio, Drive, Port Area, Manila
7. Mrs. Corazon U. Juan  
c/o PPDO-DPWTC, NIA Building, IDSA,  
Metro Manila
8. Cay. F. Ferreria  
c/o D.M.G., Inc.  
222 E. Rodriguez Sr. Blvd. Quezon City

SINGAPORE

1. Mr. Ng Kee Seng  
c/o Environmental Health Dept.  
Ministry of the Environment,  
4th Floor, Princess House, Alexandra Road,  
Singapore 3

2. Mr. Yeo Chiang Beng (George)  
c/o Ministry of the Environment
3. Mr. Teng Kin Hoong  
c/o Ministry of the Environment
4. Mr. Lau Eng Lam  
c/o Ministry of the Environment
5. Mr. Ng. Siew Wah  
c/o Ministry of the Environment

TAIWAN, R. O. C.

1. Mr. Robert Kuo-Cheng Chen  
c/o Dpt. of Environmental Eng.,  
National Chung Hsing University  
250 Kuo Kuang Road, Taichung 400
2. Mr. Wu Shing-Yu  
c/o Industrial Development Bureau,  
Ministry of Economic Affairs, R.O C.  
109 Han-Kou St., Sect. 1 Taipei
3. Mr. Szu-Kung Tseng  
c/o National Taiwan University  
Taipei,
4. Mr. Ting-Wen Liu  
c/o Taiwan Institute of Environmental Sanitation  
161 Kun Yang St., Nan Kong District, Taipei

THAILAND

1. Mr. Paitool Goolchai  
c/o Bureau of Sanitation  
Chareornpol Square, Bangkok
2. Mr. Boonyong Lohwangwatana  
c/o Industrial Environment Division  
Dep. of. Industrial Works,  
Ministry of Industry  
Rama VI Road, Bangkok

3. Mr. Prayoon Fongsatikul  
c/o Office of The National Environment Board  
260 Suriyothai Building Pahalyothin Road  
Bangkok
4. Miss Yachai Kajorvorawthanakul  
c/o Environmental Health Div.  
Dept. of Health  
Samsen Road, Bangkok

SEMINARTEAM

AIT

1. Dr. N. C. Thanh  
Chairman, Environmental Engineering Division  
Asian Institute of Technology  
P.O. Box 2754  
Bangkok, Thailand
2. Dr. B. N. Lohani  
Environmental Engineering Division
3. Dr. Chongrak Polprasert  
Environmental Engineering Division
4. Mrs. Samorn Muttamara  
Environmental Engineering Division

ERL

1. Mr. Michael Betts  
Senior Consultant  
Environmental Resources Limited  
35 A, Thayer Street  
London, WIM5LH  
England
2. Dr. Robin Bidwell  
Director  
Environmental Resources Limited

UBA

1. Mr. Georg Goosmann  
Director and Professor of the  
Subdivision for Low Waste  
Technology and Resource Recovery  
German Federal Environment Agency  
Bismarckplatz 1  
D - 1000 Berlin 33



2. Dr. Axel Schönfeld  
Senior Research Officer, Subdivision  
for Low Waste Technology and Resource  
Recovery

CDG

Mr. Günter Tharun  
Regional Director for Asia  
Carl Duisberg-Gesellschaft e.V.  
Hohenstaufenring 30 - 32  
D - 5000 Köln 1

CDG-AIT SOLID WASTE MANAGEMENT SEMINAR

SEMINAR PROGRAM

SEPTEMBER 25, MONDAY

09:00 : 09:45

OPENING SESSION

Welcome Address - Prof. H. Shi-igai

Opening Address - H.E. German Ambassador  
and

G. Tharun, Carl Duisberg Gesellschaft (CDG)

Seminar Orientation - Dr. N.C. Thanh

Master of Ceremony - Dr. B.N. Lohani

09:45 - 11:00

Coffee Break

	<u>Title</u>	<u>Subjects to be covered</u>	<u>Presented by</u>
	Chairman : N.C. Thanh		
11:00 - 12:00	Introduction to Waste Management	Relevance, etc.	G.G. N.C.T.
12:00 - 1 :30	Lunch Break		
1 :30 - 3 :00	Waste Management Decisions	Elements in decision-making Defining objectives, collecting data, etc.	R.B.
3 :00 - 3 :30	Coffee Break		
3: 30 - 5 :00	Operational Factors	Influence of climate, etc., landfill shortage, environmental pollution, markets for recovered material, types of waste, etc.	M.B.
*****	*****		
5: 30 - .....	Reception at AIT Centre.		

SEPTEMBER 26, TUESDAY

	<u>Title</u>	<u>Subjects to be covered</u>	<u>Presented by</u>
	Chairman : Michael Betts		
09:00 - 10:15	Specific problems of Waste Management in Asia	Particular problems to be highlighted : nature of waste, climate and hygiene, living conditions, economics, etc.	B.N.L./N.C.T.
10:15 - 10:45	Coffee Break		
10:45 - 12:00	Short talks by country participants	(Hongkong, Indonesia, Korea, Malaysia, Philippines, R.O.C., Singapore, Thailand)	
12:00 - 1 :30	Lunch Break		
	Chairman : Robin Bidwell		
1 :30 - 2 :30	Use of Economic Analysis in Waste Management	Building up costs, and typical techniques and their uses (DCF, etc), capital versus operating costs, estimating techniques, etc., recovery, etc.	M.B.
2 :30 - 3 :30	Landfill	Selecting sites, site investigation, site preparation, site management.	G.G. B.N.L./C.P.
3 :30 - 4 :00	Coffee Break		
4 :00 - 5 :00	Talk : Resource Recovery and Options	Review of subject	M.B.
5 :00 - 6 :00	Short Talks by Country Participants	Continuation	

SEPTEMBER 27, WEDNESDAY

	<u>Title</u>	<u>Subjects to be covered</u>	<u>Presented by</u>
		Chairman : Axel Schoenfeld	
09:00 - 10:15	Collection and Transport	Alternative household storage methods, collection methods and criteria for selecting transport options. Costs of each.	N.C.T./S.M. M.B.
10:15 - 10:45	Coffee Break		
10:45 - 12:00	Pulverisation, Baling and Composting	Types available, throughputs, operational constraints and requirements, use of compost, net costs.	G.G. C.P./S.M.
12:00 - 1 :30	Lunch Break		
1 :30 - .....	Field Visit		

SEPTEMBER 28, THURSDAY

		Chairman : B.N. Lohani	
09:00 - 10:15	Thermal processing	Types available, throughputs, operational costs and requirements, disposal of residues, costs.	A.S.
10:15 - 10:45	Coffee Break		
10:45 - 12:00	Organisation & Management & Review of Regulations on Resource Recovery.	Administrative aspects of waste management.	R.B.
12:00 - 1 :30	Lunch Break		

SEPTEMBER 28, THURSDAY

	<u>Title</u>	<u>Subjects to be covered</u>	<u>Presented by</u>
Chairman : Georg Goosmann			
1 :30 - 3 :00	Handling, Treatment & Disposal of Hazardous Wastes	Types of wastes, treatment methods, etc.	A.S.
3 :00 - 3 :30	Coffee Break		
3 :30 - 5 :00	Case Study	Introductory discussion & work	

SEPTEMBER 29, FRIDAY

Chairman : Robin Bidwell

09:00 - 10:15	Future Developments		G.G./N.C.T.
10:15 - 10:45	Coffee Break		
10:45 - 12:00	Continuation of case study preparation		
12:00 - 1 :30	Lunch Break		
1 :30 - 2 :30	Completion of case study preparation		
2 :30 - 3 :00	Coffee Break		
3 :00 - 5 :00	Presentation of Case Study		

SEPTEMBER 30, SATURDAY

09:00 - 10:30	Review of case studies, etc.
10:30 - 11:00	Coffee Break
11:00 - 12:00	Closing Session
	Closing Speech : AIT/CDG

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Notes:

G.G. - Georg Goosmann	N.C.T. - N.C. Thanh
R.B. - Robin Bidwell	B.N.L. - B.N. Lohani
M.B. - Michael Betts	C.P. - Chongrak Polprasert
A.S. - Axel Schoenfeld	S.M. - Samorn Muttamara

AIT/CDG - SOLID WASTE MANAGEMENT SEMINAR

Bangkok, September 25-30, 1978

Name of participant: ..... Country.....

EVALUATION FORM

A. Please indicate your opinion with respect to the following aspects: (please mark on right side only once for each of the aspects 1 to 4)

	Excellent	Good	Fair	Unsatis- factory
1. Subjects covered by Seminar Programme (comments e.g. "too general" or too specific", etc): ..... ..... .....				
2. Seminar papers & other material (comments). ..... ..... .....				
3. Seminar organisation & execution (comments). ..... ..... .....				
4. Overall view of the seminar (comments). ..... ..... .....				

B. Which aspects or features of the Seminar did you find the most interesting &/or useful, & which the least? (Suggestions for improvement etc.; please do not hesitate to mention any shortcomings, in order to help us with future such programmes):

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

C. Do you consider that a follow-up Seminar would be desirable.

\_\_\_ Yes \_\_\_ No  
\_\_\_     \_\_\_

If a follow-up Seminar was held, on which of the subjects covered in this Seminar would you wish to have further in-depth lecturing, discussions or case study work?

Subjects	Please indicate selectively
Planning & decision-making	.....
Operational factors & constraints	.....
Economic analysis & evaluation	.....
Resource recovery	.....
Collection & transport	.....
Pulverisation, baling	.....
Composting	.....
Thermal processing	.....
Organisation & management	.....
Hazardous wastes	.....
Legislation & regulations	.....





QUESTIONNAIRE ON SOLID WASTE MANAGEMENT

COUNTRY :

1. MANAGEMENT

1.1 Which organisations are responsible for SOLID WASTE MANAGEMENT  
(eg: local, regional, central government)?

For Collection .....  
.....  
.....

For Disposal .....  
.....  
.....

For Planning .....  
.....  
.....

1.2 Which organisations are responsible for ENVIRONMENTAL PROTECTION and  
POLLUTION CONTROL?

AIR POLLUTION.....  
.....  
.....

WATER POLLUTION.....  
.....  
.....

SEA POLLUTION.....  
.....  
.....

NOISE POLLUTION.....  
.....  
.....

ENVIRONMENTAL IMPACT ASSESSMENTS.....  
.....  
.....

PLANNING (LAND USE, etc.).....  
.....

OTHER (please state).....  
.....  
.....

2. ARISINGS

Please give any data on

TONNLS PER DAY (1) Refuse .....

(2) Other .....

ARISINGS PER CAPITA (1) Refuse.....

(2) Other .....

MOISTURE CONTENT (Refuse only)

.....  
.....

DENSITY (Refuse only)

.....  
.....

COMPOSITION (Refuse only)

.....  
.....

(Note : If data already presented at Seminar, just give reference.

.....  
.....  
.....

3. COLLECTION

Proportion Collected.....

.....

Please list principal collection methods used in your country.

.....  
.....  
.....

Do you undertake sorting of materials (eg. cans).

.....  
.....  
.....

4. DISPOSAL

Please give approximate breakdown of disposal methods

	%	Quantities and Throughput in tonnes per day (1)
Uncontrolled tipping .....	.....	.....
Controlled tipping .....	.....	.....
Incineration.....	.....	.....
Composting.....	.....	.....
Other (please state).....	.....	.....
.....	.....	.....

100%

(1) Please give throughput of facilities where available

.....  
.....  
.....  
.....



## Environmental Resources Limited

35A THAYER STREET LONDON W1M 5LH TELEPHONE 01-486 8277 TELEX 25247 (ATTN ERL)

REGIONAL SEMINAR  
ON  
SOLID WASTE MANAGEMENT

Seminar Assessment

prepared for

Carl Duisberg Gesellschaft eV

by

Environmental Resources Limited

October 1978

*Directors:* Florence Fisher, BSc (Managing) (USA) Robin Bidwell, MA, PhD William Fisher, BA (USA) Michael J Shanks, MA (Oxon), FBI  
John M Sidwick, MPWPC, MIPHE Norman A White, MS, PhD (Econ), CEng, FIMechE

*Associates:* Professor Peter C G Isaac, BSc (Eng), SM, FICE, FIWES Michael Betts, BSc R Ted Bevan, FISWM Noel Carr, BSc, DPhil  
W David Conn, M.A, DPhil (Oxon) James McLoughlin, LL.M Sandra Mason, MA Brenda Thake, BSc

*Registered Office:* Devonshire House, 1 Devonshire Street, London W1N 2DR Registered No. 1014622

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1. INTRODUCTION

1.1 This is a note on the Regional Seminar on solid waste management held in Bangkok at the Asian Institute of Technology between September 25th-30th 1978. The seminar was sponsored by the Carl Duisberg Gesellschaft (CDG) and carried out in co-operation with the Asian Institute of Technology (AIT). Environmental Resources Limited (ERL) were contracted by CDG to structure the programme, prepare the background material and develop a case study. The seminar papers were written and presented by members of ERL, the German Federal Environmental Agency (UBA) and faculty members of the Division of Environmental Engineering, AIT.

1.2 The purpose of this note is to give CDG an assessment of the seminar and to provide guidance on the structuring of future seminars on this topic.

2. EVALUATION BY THE PARTICIPANTS

2.1 At the end of the seminar, the participants were asked to complete a questionnaire. There were four groups of questions:

- A. Their evaluation of the seminar coverage, papers and material, organisation and execution and their overall view.
- B. Identification of the most interesting and least interesting parts of the seminar.
- C. Subjects to be covered in any follow-up seminars.
- D. Types of training programme required.

We have summarised the principal comments in a tabular form at the end of this note.

2.2 Comments on Seminar (A and B)

Overall, the participants' comments were very complimentary about the seminar; in particular, they praised:

- the selection of subjects
- the efficiency of the organisation
- the material that had been prepared.

The main criticisms were:

- the availability of time: there was a general feeling that the seminar covered perhaps too much ground in too little

time and that time made available for the case work and exchange of information on the participants' own experience was too limited;

- insufficient use of visual material when making the presentation;
- insufficient references to other information.

But the responses made clear that overall the participants found the seminar extremely valuable; this impression is reinforced by comments received during the course of the seminar.

### 2.3 Future Seminars (C and D)

We have analysed the responses given in answer to the question

"If a follow-up was held, on which of the subjects covered in this seminar would you wish to have further in-depth lecturing, discussions or case study work?"

Twenty-eight of the participants responded to this question. The following subjects were identified by more than half of the participants (15 or more) as of particular interest for a future seminar:

- Planning and decision making (18)
- Resource recovery (19)
- Organisation and management (15)
- Legislation and regulations (15).

Other topics which rated highly were hazardous wastes (14), economic analysis (13) and collection and transport (11).

We have summarised comments from questions C and D in the table at the end of this note. These suggest that more emphasis should be placed on experience of the individual countries in the region and that there is a demand for training courses for professionals with operating experience; particularly for advanced training on technical processes.

## 3. ERL ASSESSMENT

### 3.1 The Programme

What was the objective of the seminar? In ERL's view, it was to assist senior members of the governments in the region to take rational decisions on waste management and resource recovery problems. It was therefore necessary to give the participants an appreciation of:

- the relevant technologies
- their costs and performance characteristics
- frameworks for decision making: data handling, economic analysis, identification of alternatives etc.

Overall we believe the seminar achieved this objective. At the end of the seminar a number of the participants said they felt better able to take the types of decision and to question certain decisions that had already been taken.

We would accept that for some the programme was too intensive. In particular, on those subjects where participants had had little previous experience (eg economic analysis) the seminar probably did little more than generate an interest in the subject; and there was certainly inadequate time for the participants to do as much detailed work on the case study as they would have liked.

### 3.2 The Participants

We were impressed by the enthusiasm with which the participants approached the course; they were clearly interested and anxious to take part at every stage. They were disappointed at the limited time allotted for their comments, questions and the case study - even though this constituted around half of the total session time.

Knowledge and use of English was good but there is no doubt that the 'language gap' should be taken into account when presenting material and where possible the 'message' should be emphasised by use of visuals.

### 3.3 AIT

The hospitality and facilities were excellent and could not in any way be faulted. Similarly the material for which AIT was responsible was, in the main, well researched and very well presented. Overall we feel that AIT are an ideal partner for this type of exercise.

## 4. FUTURE SEMINARS

4.1 It may be that it is necessary to define more specifically the 'target' group for each seminar, in particular to distinguish between:

- the environmental administrator with a planning and overall decision responsibility: these will be located in environmental ministries, public health agencies, planning agencies etc at a regional and central government level;
- and those with an operational responsibility in solid waste management: directors and senior staff of solid waste organisations.



The latter group (those with operational responsibility) may be expected to gain more from seminars with the emphasis on solid waste management methods and procedures; topics would include the selection of suitable equipment, its operation and maintenance, training schedules, management controls etc.

The former group (planners and administrators) need to know the principal features of the available technology but the emphasis here needs to be more on providing the framework for taking decisions and on co-ordination rather than day-to-day management. The administrators should also be given an appreciation of the wider issues: in particular relating to public health, general environment, land-use planning, financing etc.

#### 4.2

##### Suggestions for a Future Programme

We believe that the seminar programme developed for the September seminar was well balanced, given the varied responsibilities of the participants. However, there is in our view inadequate attention being paid to training environmental administrators in the developing countries - particularly on how to take effective decisions. With this in mind and taking account of the comments made at the seminar we suggest the following be taken into account when developing future programmes for such a target group.

- The technical data (information on equipment etc) should be structured so as to have more direct relevance to administrators and to the countries in the region. In particular the costs and operating characteristics of advanced technology should be described in the context of the waste and economic problems found locally.
- At least half the time should be devoted to case work. This should be structured to highlight particular problems (eg difficulties of data collection, selection of options etc) and should be made relevant to the types of problem encountered in the region.
- More attention should be devoted to related environment and public health questions: in particular environmental impact, hygiene, water and air pollution.
- More time should be devoted to discussions on the development of regulations and their enforcement in developing countries.

There should be one free afternoon during the week. The time can be made up by one or more formal evening sessions. These evening sessions might prove a suitable forum for countries to present or discuss their own problems.

SUMMARY OF RESPONSES TO EVALUATION QUESTIONNAIRE

TABLE 1

Name	Department	Country	Comments on Seminar Papers, Presentation etc (i)	Topics of Further Seminars and Requirements for the Future (ii)
NG, Kee Seng	Environmental Health Dept	Singapore	<ul style="list-style-type: none"> <li>- Good selection of topics</li> <li>- Materials of a high standard</li> <li>- Too little time</li> <li>- Overall very beneficial</li>   <li>- Most interesting: waste management decisions</li> <li>- Least interesting: European regulations</li> <li>- More depth should be attempted in the presentation</li> </ul>	<ul style="list-style-type: none"> <li>- Study courses on SWM</li> <li>- 1-2 yrs for public health auxiliaries</li> <li>- Similar seminars for executives in SWM</li> </ul>
YEO, Chiang Beng	Environmental Health	"	<ul style="list-style-type: none"> <li>- Subjects well covered</li> <li>- One afternoon should be left free for individual activities</li>   <li>- Most interesting: planning and decision making</li> <li>- Least interesting: legislation and regulations</li> <li>- Not enough time for case study</li> </ul>	<ul style="list-style-type: none"> <li>- Seminars and short-term training for executives and public health officers and engineers covering solid waste collection, removal, treatment and disposal</li> </ul>
NG, Siew Wah	Min of the Environment	"	<ul style="list-style-type: none"> <li>- Appropriate general coverage</li> <li>- More up-to-date materials required</li> <li>- Organisation and execution 'cannot have been better'</li>   <li>- Most interesting: short talks given by participants; papers on economic analysis; establishment of personal contact with AIT and all participants</li> </ul>	<ul style="list-style-type: none"> <li>- Solid waste problems in a few selected countries should be studied individually with ERL, AIT, UBA and CDG in more detail</li>   <li>- Short seminars for officers actually on the job as well as executives desirable; specific professional background irrelevant because most Asian countries have not many people of extensive professional training</li> </ul>

(i) Responses to questions A and B.

(ii) Responses to questions C and D. Summary of C and D questions: see also Table 2.

Name	Department	Country	Comments on Seminar Papers, Presentation etc	Topics of Further Seminars and Requirements for the Future
LAU, Eng Lam	Min of the Environment	Singapore	<ul style="list-style-type: none"> <li>- Subjects too specific but just nice</li> <li>- Seminar hours too long and not enough field visits</li> <li>- Most interesting: handling, treatment and disposal of hazardous waste</li> </ul>	<ul style="list-style-type: none"> <li>- Public relations work and health education</li> <li>- Short-term training for handling, treatment and disposal of hazardous waste for people already on the job with some engineering knowledge</li> </ul>
KIM, Kyong Ho	Min of Health and Social Affairs	Korea	<ul style="list-style-type: none"> <li>- Subjects well covered</li> <li>- More visual materials desirable</li> <li>- Well organised</li> <li>- Overall more references to Asian countries should be supplemented</li> </ul>	<ul style="list-style-type: none"> <li>- Planning and decision making</li> <li>- Disposal of hazardous waste and industrial waste</li> <li>- Short seminars (around 2 weeks) for planners and engineers</li> </ul>
KIM, Kyo Eung	"	"	<ul style="list-style-type: none"> <li>- There should be more coverage on hazardous waste</li> <li>- Papers and other material sufficient</li> <li>- Relatively well organised but Japanese participants should have been invited</li> </ul>	<ul style="list-style-type: none"> <li>- Disposal of industrial waste</li> <li>- Short-term and long-term training for engineers, inspectors and planners</li> </ul>
SANTOSO, Wahju	Urban and Environment Research Centre	Indonesia	<ul style="list-style-type: none"> <li>- Most interesting: collection, transportation and management</li> </ul>	<ul style="list-style-type: none"> <li>- Field observation</li> </ul>
ABOEPRAJITNO, Nono A	"	"	<ul style="list-style-type: none"> <li>- Most interesting: site selection, investigation, preparation and management</li> <li>- Would like to see more visual presentation</li> </ul>	<ul style="list-style-type: none"> <li>- Field trips</li> <li>- Exercises in solid waste management given by local experts</li> <li>- Seminars/short-term training for upper-level officers</li> <li>- Generally exchanging information</li> </ul>

Name	Department	Country	Comments on Seminar Papers, Presentation etc	Topics of Further Seminars and Requirements for the Future
SIVAPALASUNDRAM, V	Municipality of Petaling Jaya	Malaysia	<ul style="list-style-type: none"> <li>- Subject coverage satisfactory</li> <li>- Paper and other material useful</li> <li>- Organisers have done everything possible to make seminar useful to participants</li> <li>- Overall AIT staff most courteous and helpful</li> <li>- Most interesting: case study and field visit</li> <li>- Seminar hours too long and insufficient time for free discussion</li> </ul>	<ul style="list-style-type: none"> <li>- Legislation and regulations</li> <li>- 1-3 months training for engineers, and science graduates on collection and transport, operational factors and constraints, resource recovery, pulverisation and baling, organisation and management, legislation and regulations</li> </ul>
GAN, Eng Siew	Majlis Perbandaran Pinang	"	<ul style="list-style-type: none"> <li>- Lecture time too long</li> <li>- AIT staff very helpful</li> <li>- Most interesting: case study</li> <li>- Shorter lecture hours and more site visits desirable</li> </ul>	<ul style="list-style-type: none"> <li>- Short seminars of about 2 weeks on engineering and science</li> </ul>
SIDEK bin MANDEH SHAH, Mohamed	Municipality of Ipoh	"	<ul style="list-style-type: none"> <li>- Subject coverage satisfactory</li> <li>- Material good</li> <li>- Organisation and execution good</li> <li>- Overall should be spread over longer period</li> <li>- Most interesting: collection and transport</li> <li>- Least interesting: disposal of hazardous wastes</li> </ul>	<ul style="list-style-type: none"> <li>- Short training of 1-3 months for engineers, chemists, medical officers of health</li> <li>- More practical demonstrations and site visits</li> </ul>

Name	Department	Country	Comments on Seminar Papers, Presentation etc	Topics of Further Seminars and Requirements for the Future
QUAH, Choon Huat	Majlis Perbandaran Kelang	Malaysia	<ul style="list-style-type: none"> <li>- Themes comprehensively covered</li> <li>- Material concise and well prepared but some papers have no reference list</li> <li>- Seminar well organised and disciplined</li> <li>- Good opportunity for Western technology to be transferred to Asia and for exchanging ideas</li> <li>- All subjects interesting</li> <li>- Should include subject on human relationship in waste management, public health education and safety or operational hazards</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of landfill sites to be used for housing</li> <li>- 1-3 months training for lower-level personnel in individual countries</li> </ul>
CHEN, Kuo Cheng	Dept of Environmental Engineering, National Chung Hsing University	Taiwan	<ul style="list-style-type: none"> <li>- Coverage very useful</li> <li>- Papers and material practical</li> <li>- Organisation compact</li> <li>- Overall very successful</li> <li>- Most useful: specific problems of waste management in Asia, landfill, composting and collection methods</li> <li>- Need more techniques of these methods</li> <li>- Need more time for case study</li> <li>- Field visit</li> </ul>	<ul style="list-style-type: none"> <li>- Sanitary landfill techniques</li> <li>- Construction of transfer stations</li> <li>- Pyrolysis method</li> <li>- Environmental impacts and solid waste disposal</li> <li>- Improvement on collection and transport</li> <li>- Regional seminar most suitable for local government waste management personnel in Taiwan</li> </ul>
WU, Shing Yu	Industrial Development Bureau, Min of Economic Affairs	"	<ul style="list-style-type: none"> <li>- Suitable coverage</li> <li>- Plenty of contents in papers and other material</li> <li>- Good organisation</li> <li>- Overall successful</li> <li>- Most interesting: case study, but need more time for preparation</li> </ul>	<ul style="list-style-type: none"> <li>- Hazardous industrial waste management</li> <li>- Resource recovery</li> <li>- Regional seminar on solid waste management most suitable for central and local government personnel</li> </ul>
LIU, Ting Wen	Taiwan Inst of Environmental Sanitation	"	<ul style="list-style-type: none"> <li>- Helpful coverage</li> <li>- Very useful papers and material</li> <li>- Overall very beneficial</li> <li>- Background material very useful</li> </ul>	<ul style="list-style-type: none"> <li>- Advanced study on resource recovery and thermal processing</li> <li>- 3 months training for personnel in charge of solid waste management</li> </ul>

Name	Department	Country	Comments on Seminar Papers, Presentation etc	Topics of Further Seminars and Requirements for the Future
TSENG, Szu Kung	National Taiwan University	Taiwan	<ul style="list-style-type: none"> <li>- Good coverage</li> <li>- Useful papers and material</li> <li>- Good organisation</li> <li>- Overall successful</li> <li>- Programme slightly too compact and not enough free time</li> </ul>	<ul style="list-style-type: none"> <li>- Problems relevant to developing countries</li> <li>- Seminars and short-term training suitable for Taiwan</li> </ul>
JENKINS, R T	Electrical and Mechanical Off, Public Works Dept	Hong Kong	<ul style="list-style-type: none"> <li>- Good coverage but too general for this participant's own need</li> <li>- Excellent papers and material but not issued early enough</li> <li>- Extremely well organised and executed</li> <li>- Overall good but not enough time for discussion and exchange of experience</li> <li>- Most interesting: Outline on SWM organisation and management, thermal treatment process, handling/disposal of hazardous wastes, mechanical processing and composting</li> </ul>	<ul style="list-style-type: none"> <li>- Greater in-depth study or exchange of practical experience</li> <li>- 1 week seminar on technical aspects of SWM for civil/elec/mech engineers in senior management positions</li> <li>- Practical training for plant operators/supervisors</li> </ul>
WONG, Mang Ki	Civil Eng Off, Public Works Dept	"	<ul style="list-style-type: none"> <li>- Adequate coverage</li> <li>- Well prepared papers and material</li> <li>- Very well organised in view of wide scope of subject and large number of participants</li> <li>- Overall most useful</li> <li>- Most interesting: planning and management, economics of waste disposal and methods of disposal</li> </ul>	<ul style="list-style-type: none"> <li>- Legislation and regulations and their enforcement</li> <li>- Seminars for management-level personnel</li> <li>- Short-term training and technical seminars for professional officers</li> <li>- In-plant training for operatives</li> </ul>
Boonyong Lohwangwatana	Industrial Environmental Div, Dept of Industrial Works	Thailand	<ul style="list-style-type: none"> <li>- Seminar duration too short</li> <li>- Papers and material very useful</li> <li>- Good organisation</li> <li>- Overall perfect and very good participation</li> </ul>	<ul style="list-style-type: none"> <li>- Sanitary landfill site management including dumping of garbage, toxic waste and construction debris, air pollution and fire hazard prevention and water pollution</li> </ul>

Name	Department	Country	Comments on Seminar Papers, Presentation etc	Topics of Further Seminars and Requirements for the Future
Boonyong Lohwangwatana (Cont'd)	Industrial Works	Thailand	<ul style="list-style-type: none"> <li>- Most interesting: case study, but more time needed and solutions prepared by lecturer would be useful for comparison and guidance</li> </ul>	<ul style="list-style-type: none"> <li>- Short-term training including lectures, site visits, practical work and data collection</li> </ul>
Prayoon Fongsatitkul	National Environment Board	"	<ul style="list-style-type: none"> <li>- Good coverage</li> <li>- Excellent papers and material</li> <li>- Good organisation</li> <li>- Most interesting: case study, but more time and data needed</li> <li>- Least interesting: hazardous waste</li> </ul>	<ul style="list-style-type: none"> <li>- Economic analysis and evaluation</li> <li>- Incineration</li> <li>- Short and long-term plan to solve SWM problems in individual countries</li> </ul>
Paitool Goolchai	Bureau of Sanitation	"	<ul style="list-style-type: none"> <li>- Excellent coverage, papers and material, and organisation and execution</li> <li>- Most interesting: technology and know-how of solid waste disposal and transportation, recycling of the waste</li> <li>- More time needed for case study as well as seminar itself</li> </ul>	<ul style="list-style-type: none"> <li>- Short and long-term training on disposal landfill, composting and incineration</li> </ul>
TABLANTE, Evangeline V	Environmental Sanitation Centre	Philippines	<ul style="list-style-type: none"> <li>- Detailed coverage</li> <li>- Very helpful papers and material</li> <li>- Good lecturers</li> <li>- Overall really interesting and informative</li> </ul>	<ul style="list-style-type: none"> <li>- Case study should be given to each group working with all the constraints</li> <li>- Short-term training for technical personnel handling SWM</li> </ul>
VIRAY, P P	National Pollution Control Comm	"	<ul style="list-style-type: none"> <li>- Good coverage but a little too general</li> <li>- Good papers and material</li> <li>- Arrangement of seats needs improving</li> <li>- Suggest more planners and manager as speakers</li> <li>- Most interesting: case study but more time needed</li> <li>- Least interesting: collection and transport, should have included specifications and costs of equipment and maintenance should have been treated</li> </ul>	<ul style="list-style-type: none"> <li>- Evaluation of programme</li> <li>- Standards used in both northern and southern countries</li> <li>- Long-term in-plant training for managerial and technician level</li> <li>- Short-term training for planners and managers</li> </ul>



Name	Department	Country	Comments on Seminar Papers, Presentation etc	Topics of Further Seminars and Requirements for the Future
PEREZ, Atty Jose B	Refuse and Environmental Sanitation Centre	Philippines	<ul style="list-style-type: none"> <li>- Good coverage</li> <li>- Excellent papers and material</li> <li>- Excellent organisation and execution</li> <li>- Overall good</li> <li>- Most interesting: case study</li> </ul>	<ul style="list-style-type: none"> <li>- Planning and decision making, organisation and management, collection and transport</li> <li>- Short-term training with lectures, discussion and actual case study for environmental engineers with experience in SWM</li> </ul>
TOLENTINO, Sixto E		"	<ul style="list-style-type: none"> <li>- Informative coverage</li> <li>- Excellent papers and material</li> <li>- Well organised and executed</li> <li>- Overall very impressive</li> <li>- Most interesting: case study, planning and decision making, organisation and management</li> </ul>	<ul style="list-style-type: none"> <li>- Environmental impact assessment - strategies and approaches</li> <li>- Planning and decision making on environmental assessment preparation</li> <li>- In-plant training</li> </ul>
SENGA, Pollyana J	National Environment Protection Council	"	<ul style="list-style-type: none"> <li>- Comprehensive coverage</li> <li>- Should allow more time to read through papers before seminar</li> <li>- Well organised and good time management</li> <li>- Overall smoothly executed</li> <li>- Case study very challenging and useful</li> </ul>	<ul style="list-style-type: none"> <li>- More economic analysis and ecology aspect to follow the actual application of principles of case study would be desirable</li> <li>- Environmental impact assessment</li> <li>- Legislation and regulations</li> <li>- Short training on planning and decision making for government planners</li> </ul>
FERRERIA, Cay F	DMG Inc	"	<ul style="list-style-type: none"> <li>- Adequate coverage</li> <li>- Excellent material and organisation</li> <li>- More Asian data should be made available</li> <li>- Most interesting: case study but suggest it be sent ahead to allow more time for preparation and in-depth consideration</li> </ul>	<ul style="list-style-type: none"> <li>- Planning and decision making</li> <li>- Economic analysis and evaluation</li> <li>- 10-day training for management and technical personnel on above subjects</li> </ul>

Name	Department	Country	Comments on Seminar Papers, Presentation etc	Topics of Further Seminars and Requirements for the Future
CORAZON, Umali Juan	PPDO-DPWTC	Philippines	<ul style="list-style-type: none"> <li>- Good coverage</li> <li>- Good papers and material</li> <li>- Highly commendable organisation and execution</li> <li>- Overall flexible enough and realistic in all aspects</li> <li>- Most interesting: presenting conditions from each country and how the seminar connected them up with all the lectures plus a very good give and take interaction.</li> </ul>	<ul style="list-style-type: none"> <li>- Planning and decision making</li> <li>- Financing aspects for all types of solid waste disposal systems</li> <li>- 2-3 weeks training for technical and professional personnel on above subjects</li> </ul>

TABLE 2: RESPONSES TO FIRST PART OF QUESTION C

Subjects																		Total					
Planning and decision making	5	x	x	x	2	x	x				x	1	x	x	x	x	x	x	x	1	18		
Operational factors and constraints	6		x		x	2	3		x				x	x		x			x		10		
Economic analysis and evaluation	4			x				x	x	x	x	x	2	x		x		x	x		13		
Resource recovery	2	x	x	x		x	4	x	x	x	x	x	x	6		x		x	x	x	x	2	19
Collection and transport		x			x	x		x	x	x		7		x	x		x			3		11	
Pulverisation and baling		x				5		x				3	x		x		x					7	
Composting		x		x				x	x	x		x	2	x		x	x					10	
Thermal processing		x			x			x	x		x	x	1		x					5		9	
Organisation and management	1			x	x	1	4	x	x				5	x	4	x			x	x	x	x	15
Hazardous wastes	2	1	x	x	x	x		x		x	x	x	4	x			x				4	14	
Legislation and regulations	3	x	x			x	3	1	x	x		x		3			x	x	x	x		15	

Seminar on

**SOLID WASTE MANAGEMENT**  
**AIT BANGKOK**

25th - 30th September 1978

**BACKGROUND MATERIAL**

prepared for the seminar by

**ENVIRONMENTAL RESOURCES LIMITED,**  
**LONDON.**

## C O N T E N T S

1. WASTE COMPOSITION, SURVEYS & PLANS
  - 1.1. Composition, Yield & Analysis of Domestic Refuse
  - 1.2. Classifications of Waste to be Covered by Waste Disposal Surveys
  - 1.3. Guideline for the Preparation of a Waste Disposal Plan
  
2. WASTE COLLECTION & TRANSPORT
  - 2.1. Conventional Systems
  - 2.2. An Automatic System
  - 2.3. London Railhaul
  
3. WASTE TREATMENT METHODS
  - 3.1. Landfill
  - 3.2. Incineration
  - 3.3. Pyrolysis
  - 3.4. Composting
  - 3.5. Baling & Shredding
  
4. RESOURCE RECOVERY
  - 4.1. Waste Derived Fuel
  - 4.2. Sewage Sludge
  - 4.3. Agricultural & Food Wastes - Developing Countries
  - 4.4. Agricultural Waste to Energy: Research at the University of the Philippines
  - 4.5. Resource Recovery from Municipal Solid Wastes
  - 4.6. Recovery from Industrial Wastes

5. HAZARDOUS WASTES

5.1. Toxic & Other Hazardous Wastes

5.2. Transport & Labelling

6. WASTE MANAGEMENT ASPECTS

6.1. Refuse Disposal... in Singapore

6.2. Legal Aspects of Solid Waste Disposal

6.3. Economics of Solid Waste Disposal

6.4. Bulk Transfer..Costs involved

6.5. Municipal Wastes: Economic Aspects of Technological Alternatives

SEMINAR PAPERS

1. Introduction to Waste Management G. Goosmann, UBA
2. A Review of the Key Elements in Waste Management Planning and Decision Making R. Bidwell, ERL
3. Operational Factors. A Review of the Main Factors affecting Solid Waste Management Operations. M. Betts, ERL
4. The use of Economic Analysis in Waste Management Decision Making S. Mason, ERL
5. Landfill. A Review of the Science and Practice of Controlled Tipping R. E. Bevan, ERL
6. Options for Resource Recovery from Solid Waste - Background Paper M. Betts, ERL
7. Collection and Transport of Refuse - Introductory Comments A. French, ERL
8. Mechanical Processing and Composting G. Goosmann, UBA
9. Thermal Treatment of Household Wastes Ch. Nels, UBA
10. Handling, Treatment and Disposal of Hazardous Wastes U. Wiedemann, UBA
11. A Review of Waste Management and Resource Recovery Regulations R. Bidwell, ERL
12. Organisation and Management. A Review of Administrative Aspects of Waste Management R. Bidwell, ERL
13. Specific Problems of Solid Waste Management in Asia B.N. Lohani and N.C. Thanh, AIT
14. Sanitary Landfill: A General Review and Problems in Asia B.N. Lohani and C. Polprasert, AIT
15. Collection and Transportation of Solid Wastes in Asia N.C. Thanh and S. Muttamara, AIT
16. Refuse Baling and Pulverization/Composting in Asia C. Polprasert and S. Muttamara, AIT

PARTICIPANTS' PAPERS

1. Controlled Tipping in Hong Kong	M.K. Wong	HONG KONG
2. Country Report Indonesia	Nono A. Aboeprajitno Wahya Santoso	INDONESIA
3. Solid Waste Disposal in Korea	KIM Kyong Ho KIM Kyu Eung	KOREA
4. A Brief Report on my Experiences and Malaysia's Situation in the Field of Solid waste Management	Quah Choön Huat	MALAYSIA
5. Solid Waste Management Report: Metropolitan Manila Experience	J.H. Espiritu	PHILIPPINES
6. The Refuse Management System in Metropolitan Manila	E.V. Tablante	PHILIPPINES
7. Marketability of Waste Recovered Materials	C.F. Ferreria	PHILIPPINES
8. Recycling and Non-Waste Technology in Asia Today	B.A. Rossi	PHILIPPINES
9. Bio-Gas Production from Piggery Wastes	P.P. Viray	PHILIPPINES
10. Present Status of Solid Waste Management in Metro Manila	P.J. Seña R.V. Venal	PHILIPPINES
11. The Impact of Water Pollution on the National Economy	S.E. Tolentino Jr.	PHILIPPINES
12. Solid Waste Disposal Subsidy Program	P.J. Seña	PHILIPPINES
13. Management on Refuse Disposal Ground	Lau Eng Lam	SINGAPORE
14. Re-Routing of Refuse Collection Routes in Singapore	Ng Kee Seng	SINGAPORE
15. Fleet Maintenance of Vehicles Utilized in the Collection and Conveyance of Solid Waste	Ng Siew Wah	SINGAPORE
16. The Mechanisation of Street Cleansing in Singapore	Teng Kin Hoong	SINGAPORE
17. Solid Waste Management in Singapore	G.C.B. Yeo	SINGAPORE
18. Sanitary Landfill Approach to Disposal of Municipal Refuse in a Developing Country	R. Kuo-Cheng Chen	TAIWAN



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|--|-------------|----------|
| 19. Study of the Possibility of a Closed Cycle System of Organic Waste Disposal                | C.Y. Chuang | TAIWAN   |
| 20. Planning of Overall Disposal for Municipal Refuse and Industrial Solid Waste in Kao-Hsiung | C.Y. Chuang | TAIWAN   |
| 21. Outline of Disposal of Solid Waste in Taiwan   | C.Y. Chuang | TAIWAN   |
| 22. The Use of Red Mud ( Bauxite Residuum ) as a Filler of Plastic                             | Wu Shing-Yu | TAIWAN   |
| 23. Sanitary Landfill at Onn Nuj Dumping Ground  | P. Goolchai | THAILAND |

SEMINAR ON SOLID WASTE MANAGEMENT

CASE STUDY

1. APPROACH

- (a) Summarise existing waste arisings for each area; (this is best done by showing quantities of each type on the map).
- (b) Analyse information on existing (1978) disposal and treatment facilities. Show this information also on the map.
- (c) Show where and how each type of waste are disposed of at present. (Please note: do not expect that arisings and through put of facilities will exactly match).
- (d) List the main problems and rank them in order of importance.
- (e) Analyse information on sites which may be available in the future.
- (f) Make an assessment of how wastes will vary during the next few years.
- (g) List the additional problems taking account of (d), (e) and (f).
- (h) List the main options for overcoming immediate and future problems ((d) and (g)).
- (i) Analyse these showing capital costs, cost per tonne and other implications.
- (j) List the further investigations that will be required to finally decide on the most appropriate action.

2. PRESENTATION

Each of the six groups will be asked to present their findings and conclusions. The presentation should not take more than 15 minutes: about five minutes summarising the problems and ten minutes outlining options, conclusions and need for further investigation.

3. CONSTRAINTS

Different groups will be operating under different constraints.

Group 1: ADB offers a grant to cover capital cost of new resource recovery scheme.

Group 2: Rail/Road bridge cannot take additional traffic. Only No. 6 and No.7 site (Map 4) available in NE area.

- Group 3 : Government has policy of using labour intensive schemes where possible.
- Group 4 : Government does not wish capital intensive schemes to be used.
- Group 5 : ADB offers grant of \$10 million if NE and SW area co-operate.
- Group 6 : Serious pollution at sites number 10 and 7 (Map 4).
- Group 1-3: Lack of skilled mechanics
- Group 4-6: Increasing pressure on land use.

4. CHANGES TO DENSITY

- Page 24: Density of waste (1.1) 0.2 tonnes/cu.m. for standard vehicle, 0.4 tonnes/cu.m. for compacting vehicle.  
Density for transfer 0.4 tonnes/cu.m. (2.1).
- Page 25: Graph 1 assumes density of 0.4 tonnes/cu.m.

Georg Goosmann

Berlin, January 1979

TRIP REPORT

(slightly shortened version)

Trip on behalf of the Carl Duisberg Gesellschaft e.V., from  
10-23.12.78.

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Statement of Tasks:

1. Participation as observer at a Symposium "Environmental Engineering" (Environmental problems of 'agriculturally-oriented industries': paper industry, breweries, sugar factories, etc.), from 18-22.12.1978 in Tokyo.

Organiser: Asian Productivity Organisation (APO).

2. Establishing contact with participants of the first Waste Management Seminar, Bangkok, September 1978, in Manila, (Hong Kong) and Taipei for the purpose of follow-up evaluation and information collection for the planning of further seminars. Additionally: advice on the application of the training content of the first Seminar in practice.
3. Visit to the Asian Institute of Technology (AIT), Bangkok: Programme pre-planning for subsequent seminar.

Trip Itinerary:

11.12.1978

Meeting with Mr Cay. F. Ferreria and Mrs Cora Juan (Seminar participants).

Programme planning for the stay in Manila.

12.12.1978

Visit to Mr Edmund Mapua, Eastman Chemical Industries Inc.. This firm is active in the field of industrial emission control (water, air). Discussion on effluent and waste problems of the textile, food and chemical industries. (Great interest in participation of a German enterprise for the purpose of advising on and supplying

equipment for further extending pollution control activities in the industrial field.

Viewing of a household refuse tip with Mr. Ferreria and Mr. Atty Perez (Seminar participants, Metropolitan Manila Commission, Refuse and Environmental Sanitation Center (RESC) ). On this large site, the total refuse of 'Manila proper' (city area) is tipped. No controlled tipping. Gas problems, tip burning at several points, depending on wind direction, surrounding urban areas are directly affected. Possibilities of fire fighting (suffocation of fires through covering with fresh refuse and repeated compaction) were extensively discussed.

Another problem is the effect on tip operation of scavengers who sort out metals, glass, paper, etc., immediately next to the bulldozers which are employed. It was reported that, a few days previously, a child was fatally injured under the bulldozer while scavenging. Proper use of equipment on the site appears to be impossible unless scavenging is organized, i.e. to limit times and locations, so that effective and unhindered site operation is possible.

Composting: In the late '50's, WHO erected a test compost plant on the tip site (pulverising plant, ventilated and covered windrow composting) of which 'the remains' were inspected. The tests were abandoned due to an alleged lack of sales possibilities. Later, a trommel composting plant (Dano system?) was erected, which had been dismantled in Japan and, by way of reparation, 'transplanted' to Manila, and which nevertheless was never put into regular operation.

13.12.1978, a.m.:

Inspection of Maya Farm (60 km south of Manila), pig fattening with currently 12,000 head and biogas recovery: wet manure removal, 24-30 day anaerobic fermentation, partly discontinuous, continuous in the newer part. Gas is cleaned and employed in gas motors (deep wells, feed mill, etc.). The energy demand of the total plant with fattening facility, feed mill, slaughterhouse, carcass processing plant (slaughter waste processing) could be reduced by ca 35 %.

The solid fermentation residues are mixed with the pig feed, after dewatering and drying (covered drying beds); high vitamin B12 content. The effluent is handled in multi-stage ponds, the first stage with windmill-operated surface aeration. The final pond is used for fish breeding; the overflow serves to irrigate maize fields. The nutrient-rich scum of the secondly settling pond is fed upon by a certain kind of game animal. Introduction of 2,000 ducks planned. A detailed

publication by the owners of Maya Farm about the complete system is in preparation.

13.12.1978, p.m.:

Visit to the Manila Seedling Bank Foundation, with Ferreria and Perez. This Foundation, created by President Marcos in 1977 (?), has built up a modern and very productive tree nursery and conducts afforestation projects, amongst other things, for the purpose of producing firewood. I had by chance met the project leader Ketola (Finland) in October on the flight back from Bangkok, and discussed with him the possibilities of employing refuse compost in afforestation projects. Thereupon, I had established contacts between Ketola and the Seminar participants. A meeting had already taken place in November (Ferreria-Perez-Ketola), at which co-operation between the afforestation programme and the compost plant planning was discussed and also concluded at a higher level. Currently, the demand of the Seedling Bank Foundation for soil improvement material is still limited (ca. 3,000 t/a as substitute for imported peat); it will increase considerably in future.

Ensuing conversation with the Vice-President of DMG (Industrial firm, General Agency for VW, employer of Ferreria). DMG has established a charitable foundation, which is also concerned with environmental problems, i.a. with refuse composting. Ferreria is released partly for these types of activities under the auspices of the foundation.

Later conversation with the Assistant Minister, Theodore T. Encarnation, Ministry of Public Works, Transportation and Communications, NIA Building, EDSA, Quezon City, together with Ferreria and Mrs. Cora Juan, who works there and had arranged the visit. This Ministry is responsible, amongst other things, for planning waste disposal. We discussed mainly the possibilities for refuse composting and selling compost. They envisage in the first instance establishing a 100 t/day pilot plant. I referred to the possibilities of using compost within the context of the National Afforestation Programme (contact with Herr Ketola had already been made through Mrs. Juan).

14.12.1978, Hong Kong

The intended meeting with Jenkins, Wong and de Fleury (Seminar participants) did not come about, as my letter obviously did not arrive in time. I spoke with a Mr Ho Li (?). They seem to be very pleased with the advice and performance of ERL, London, particularly because they have no committed interest in expensive technology (e.g. incinerators).

Further travel to Taipei. Greeted there by Mr. W.C.W. Lin, International Cooperation Department.

14.12.1978, evening:

Meeting with Seminar participants. (Programme planning for 15 - 17.12.1978.)

15.12.1978:

Meeting with Mr Chin Juan Chuang, Director, Environmental Health (should have participated in the Bangkok Seminar, but had visa problems). Interesting discussion about future waste disposal in Taipei. Chuang favours incineration and wants to adopt Japanese models. Yet other waste management specialists are sceptical about the prospects of energy recovery through incineration and the costs involved because of the low calorific value of refuse in Taipei, ca. 1.200 kcal/kg.

15.12.1978, p.m.:

Visit to the Environmental Sanitation Department, Taipei City Government. Conversation with Mr Chi Chiu-Chuang, Vice Director, and the head of the operating department, Mr Chang-Chai Huang, who gave an account of the waste management problems in Taipei. Subsequent inspection of the refuse tipping site: uncontrolled dump. 1,200 t/day. Delivery well organized. Refuse is pushed from above over the tipping edge, uncovered slope, ca. 10 m high, occasional smouldering fires, leachate appears at various points. Possibilities for transformation to controlled tipping (building up of layers from underneath) were discussed in detail on site. Refuse composition of individual loads extremely variable, in part, quite combustible and, in part, only compostable; a lot of plastic film. Water content 60 - 70 %. Nearby, a rusty, uninstalled Rheinstahl composting plant with four trommels was observed, bought by a private company; the Government had to pay as this firm ran into economic difficulties and closed down after another, smaller Rheinstahl plant started operation.

Subsequent visit to the Taiwan Provincial Government, Director Mei-Chan Lo. (This government office had sent a participant to Bangkok, Mr Tin-Wen Liu, who took part in the conversations on 15.12.1978.) Again, technical discussions about landfill techniques and composting. Those at the Provincial Government are justifiably sceptical with respect to the chances of refuse incineration, as the proportion of combustible components in refuse in the provinces is clearly even lower than in Taipei.

16.12.1978, evening:

Conversation with Mr Kuang-Der Chou, Director, Environmental Sanitation Department, Municipal Government of Taipei (only a short while in the department, replacing Mr Pan), together with other waste management officers.

First of all, the conversation of the large dump seen the previous day to 'controlled tipping' was discussed, and defined with the aid of sketches. Director Chou agreed to instigate the conversation (moving the access road to the flat plateau below the present tip face, tipping in layers, inclining slightly against the open face).

Numerous further questions of a general nature (influence of climate and the insular character of Taiwan on waste management planning), and also very specialized queries (sewer and gully cleaning problems) were considered. In general, a very effective working meeting.

17.12.1978, p.m.:

Conversation with the Director of the International Cooperation Department, Mr Chin-Son Sun, to whom, as my official host, I related in detail the discussions and impressions of my stay in Taiwan.

Celebrations of the founding of CDG Taiwan are planned for January 1979.

The work programme up until this point provides for:

Preparation of 'follow-up seminars' in Taiwan based on the documentation of the Bangkok Seminar and translation of these documents into Chinese; same procedure with respect to other CDG events outside Taiwan, in which representatives from Taiwan participate.

Travel to Tokyo, arrival there on 17.12.1978 around 22.30. Welcome by Mr Y. Ohnishi and S.K. Subbramanian from the APO and preliminary discussion of the Symposium.

18.12. - 21.12.1978:

Participation in the APO Symposium on Environmental Engineering as observer on behalf of CDG.

The Symposium was undoubtedly a success. However, the technical discussion degenerated somewhat into plain technical detail, which took place mainly between Indian and Japanese experts, and was of little use to the less-specialised representatives of other countries. As emerged in personal discussions, co-operation between APO and CDG is very much welcomed by certain countries (e.g. India, Taiwan, the Philippines, Thailand).



22.12.1978:

Visit to the Asian Institute of Technology, Bangkok. Conversations with Dr Thanh and Dr Lohani about the planned, second CDG/AIT - Waste Management Seminar at the end of 1979 in Bangkok. There was agreement that the planned Seminar should be concerned with waste management again, as hardly any Seminars had until now been presented on this theme, and the need for training, and exchange of information and experience in this field is great. My conversations in those countries visited definitely confirmed this.

Selection of participants:

A 'team' from each country should be invited, which ideally should be made up of representatives of the politically-responsible level of government, the supervising authority level, and the operational level (e.g. operating engineers). This concept for selecting participants appears to be most appropriate for promoting vertical co-operation in transposing the results of the Seminar. It is appreciated that it will be difficult to achieve this concept in all cases.

The APO should send observers and, if necessary, a lecturer.

Programme Organization:

Technical subjects:

1. Landfill (planning, operation, control).
2. Incineration/composting (relevance, energy use/compost demand, marketing, economic analyses).
3. Refuse analysis (sampling, methods of analysis, interpretation of results).
4. Collection and transport (including recycling by separate collection, 'scavenging' problems).
5. Industrial wastes, hazardous wastes (control, disposal and recovery technologies).

For each subject area, selected contributions of participants should be brought into the discussion (in place of the general 'country reports'). Management, planning, decision-making, economic analysis should be emphasized, and not technical details.

Case studies/group work:

If possible, 2 - 3 case studies should be prepared, which are then worked on in groups, maybe selectively (not everyone would need to work on every case study).

A minimum of 2 days should be made available for this.

Timing:

AIT prefers the Seminar to begin on a Tuesday. If possible, the Seminar should extend to Monday or Tuesday of the following week, i.e. to include a weekend which can be partly used for Seminar work. An afternoon of a weekday should remain free.

Preparation:

It appears urgently necessary to hold a programme-planning meeting of organizers and lecturers as soon as possible (CDG, AIT, UBA, ERL), at which the preparatory work is clearly allocated and co-ordinated, e.g. in Cologne, at the latest April 1979.

Signed, Georg Goosmann