

ReSAGPAPR WG Newsletter

Volume 4, Issue 2 January 31, 2015

Published by the Working Group on Remediation for Soil and Groundwater Pollution of Asian and Pacific Region

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Member Countries :



Australia



India



Indonesia



Japan



Korea



Malaysia



New Zealand



Philippines



Sri Lanka



R.O.C.(Taiwan)



Thailand



Vietnam



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R.O.C.(Taiwan)



Thailand



Vietnam

Message from Taiwan EPA



Dr. Kuo-Yen Wei (魏國彥)

Minister

Environmental Protection Administration, Taiwan

Dr. Kuo-Yen Wei received his Ph.D. degree from Graduate School of Oceanography, University of Rhode Island. He is the Minister of Environmental Protection Administration (EPA), Executive Yuan, R.O.C. (Taiwan). He is Professor in Department of Geosciences (1994 to now), National Taiwan University (NTU). He is Adjunct Research Fellow in Institute of Earth Sciences, Academia Sinica.

Distinguished Deputy Minister, Director Generals, Deputy Director Generals, Steering Committee members of Working Group of ReSAGPAPR, ladies and gentlemen:

I am very glad to meet all of you, the representative persons from 12 country members of the Working Group on the Remediation of Soil and Groundwater Pollution of Asian and Pacific Region, so-called ReSAGPAPR. The rules of the working group were approved in the first Official Business Meeting held at Taipei, Taiwan, on June 13, 2011. The objectives of the Working Group are to promote the research activities, policy development, and management strategies to developing the innovative remediation techniques on soil and groundwater-contaminated sites and also on disseminating the knowledge and technologies for the benefit of the member of the working group in the Asian and Pacific Region.

In last four years, many conferences, workshops, training courses, and visiting study tours were supported by the Taiwan

EPA and conducted by the working group of ReSAGPAPR. I can mention some important programs as followings:

- In 2011, the activities included (1) the conference on human health risk assessment of soil and groundwater contaminated sites; (2) workshop on characterization and remediation for contaminated sites; and (3) workshop on regulatory standard and management of pollutants of the contamination sites.
- In 2012, the activities included (1) workshop on phytoremediation techniques for the heavy metals or organic pollutants of the contaminated sites; (2) international conference on remediation and management of soil and groundwater contaminated sites and soil and groundwater exhibition.
- In 2013, the activities included (1) workshop on the permeable reactive barriers (PRB) remediation techniques for the dense non-aqueous phase liquid (DNAPL) or other pollutants, and (2) two weeks training course on the survey and

remediation of soil and groundwater pollution.

- In 2014, the activities included (1) international workshop on systematic soil sampling strategies and (2) International conference on remediation and management of soil and groundwater contaminated sites and environmental exhibition.

The communication among the country members of the Working Group of ReSAGPAPR has indicated information and experience sharing beyond technical issues such as regulation and policy development, integrated site management, and specific issues for individual country is needed for more cooperation and communication. Taiwan EPA support and organize this Director Generals Summit Meeting of 12 country members of Working Group to meet here to discuss some important issues in this afternoon and also in next few days for more communication during the conference and exhibition. The objectives of this summit meeting are:

- To review and recognize the achievements made by the collective efforts of the country members of the ReSAGPAPR Working Group;
- To strength the missions of the ReSAGPAPR Working Group to tackle both technical and non-technical challenges in contaminated land management; and
- To discuss potential upgrading the ReSAGPAPR Working Group to the Asia and Pacific Contaminated Site Management Partnership (APCoSMaP) and endorse this regional collaboration by signing a Statement.

Lastly, I would like to thank all the Director Generals and steering Committee members of the Working Group of ReSAGPAPR from 10 countries to attend this summit meeting. I hope you'll enjoy this meeting, international conference and exhibition and also study tour after the conference in Taipei and also in central and southern Taiwan in next few days.

Thank you.



Program of Director General Summit Meeting on Site Remediation The ReSAG Working Group

Date: **November 25, 2014**

Venue: **Meeting Room CR403, Howard Plaza Hotel Taipei, Taipei, Taiwan**

Time	Topics	Chairman / Speaker
1400-1430	<p style="text-align: center;">Opening ceremony</p> <p style="text-align: center;">Remarks by Minister of Taiwan EPA (Dr. Wei)</p> <p style="text-align: center;">Group photo</p>	
1430-1500	Keynote speech	<p>Mr. Hung-The Tsai Executive Secretary SAGPR/FMB Taiwan EPA</p>
1500-1550	1 st Item: Experience sharing on establishing, implementing, and revising the regulations and policies for soil and groundwater remediation, and the impacts on the environment, economy and community	DGs and steering committee members
1550-1610	Coffee break	
1610-1700	2 nd Item: Experience sharing on creating a special funding or seeking budgets for soil and groundwater remediation	DGs and steering committee members
1700-1750	3 rd Item: Discussion on strengthening the bilateral or multi-lateral cooperation among the member countries of the Working Group to promote the sustainable management of contaminated sites in the Asia and Pacific Region	DGs and steering committee members
1750-1800	Closing ceremony	

Minutes of Director General Summit Meeting on Site Remediation The ReSAG Working Group

Date: 14:00 - 18:00, November 25, 2014

Venue: Meeting Room CR403, Howard Plaza Hotel Taipei, Taipei, Taiwan

Present:

(Taiwan) Dr. Kuo-Yen Wei (Minister, Environmental Protection Agency)

Mr. Hung-Teh Tsai (Executive Secretary, SAGPR/FMB, Environmental Protection Agency)

Mr. Tsung-Yung Liu (Executive Secretary, Sustainable Development Office, EPA)

Dr. Zueng-Sang Chen (Chairman, WG ReSAGPAPR)

Dr. Hao-Chun Hung (Senior Environmental Technology Specialist, SAGPR/FMB, EPA)

Mr. Whai-Jing Kao (Ministry of Foreign Affairs)

(Australia) Mr. Tony Circelli (Chief Executive, Environmental Protection Authority (South Australia))

Mr. Andrew Pruszinski (Manager Site Contamination, Environmental Protection Authority (South Australia))

(Indonesia) Mr. Achmad Gunawan (Deputy Assistant for Hazardous Waste Management and Hazardous Waste Contaminated Remediation; Deputy for Toxic Materials, Hazardous and Solid Waste Management, Ministry of Environment)

(Japan) Mr. Osami Sagisaka (Former Director-General of the Environmental Management Bureau, Ministry of the Environment (2009-2012))

Dr. Masanori Kobayashi (Fellow, Yokohama National University (YNU))

(Korea) Mr. Hoe-Seog Cheong (Director General, Water Supply and Sewerage Policy Bureau, Ministry of Environment)

Mr. Jung-Chul Park (Deputy Director, Soil & Groundwater Management Division, Ministry of Environment)

(Malaysia) Mr. Yunus bin Abd Razak (Director General, Minerals and Geoscience Department Malaysia)

Mr. Tuan Rusli Mohamed (Deputy Director, Minerals and Geoscience Department Malaysia, Perak, Ministry of Natural Resources and Environment)

(New Zealand) Mr. Bruce Croucher (Senior Analyst, Administer of Contaminated Sites Remediation Fund)

(Sri Lanka) Mr. K.A.I.D. Silva (Director, Air Resources Management and International Relations, Ministry of Environment and Renewable Energy)

In Attendance:

Ms. Yae-Jin Park (Korea, English-Korean translator of Korea MOE)

Mr. Zih-Sin Wang (Taiwan), Ms. Ya-Ting Wu (Taiwan)

Minutes of Director General Summit Meeting on Site Remediation The ReSAG Working Group continued

Opening Ceremony at 14:00 - 14:30

1. Dr. Kuo-Yen Wei, who is the Minister of Taiwan Environmental Protection Administration, introduced all the participants, including the director generals from Asian and Pacific Region and the Steering Committee members of WG.
2. Dr. Kuo-Yen Wei delivered an opening address and welcomed all invited participants.



Dr. Kuo-Yen Wei (魏國彥)

Minister

Environmental Protection Administration, Taiwan

Keynote Speech at 14:30 - 15:00

3. Mr. Hung-Teh Tsai made a presentation on “Regional Collaboration for Contaminated Site Management”.



Mr. Hung-Teh Tsai (蔡鴻德)

Steering Committee Member of WG ReSAGPAPR

Executive Secretary

Soil and Groundwater Remediation Fund Management Board

Environmental Protection Administration, Taiwan



Minutes of Director General Summit Meeting on Site Remediation The ReSAG Working Group continued



Mr. Tony Circelli
Australia



Mr. Achmad Gunawan
Indonesia



Mr. Osami Sagisaka
Japan



Dr. Hoe-Seog Cheong
Korea



Mr. Yunus bin Abd Razak
Malaysia



Mr. Bruce Croucher
New Zealand



Mr. K.A.I.D. Silva
Sri Lanka

Minutes of Director General Summit Meeting on Site Remediation The ReSAG Working Group continued

Business Meeting at 15:00 - 15:50

Discussion Item 1: Experience sharing on establishing, implementing, and revising the regulations and policies for soil and groundwater remediation, and the impacts on the environment, economy and community

4. The contaminated site management will be the main theme for future regional collaboration in regulatory entity, academia, and consultancy. We will support and advise the development of regulation, technology as well as related training.
5. Sustainable use of land and contaminated sites remediation will be the core for regional environmental technology development within this partnership and we will commit our efforts to foster the common achievement.
6. The exchange of information on related technologies, environmental data, and regulatory and policy issues are vital to the members and continuing works on establishing such channels and networks shall be considered.

Business Meeting at 16:10 - 17:50

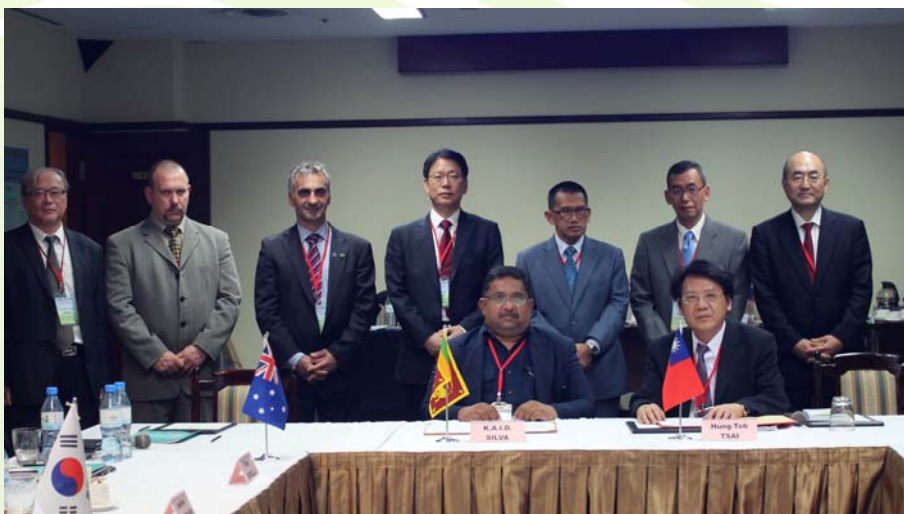
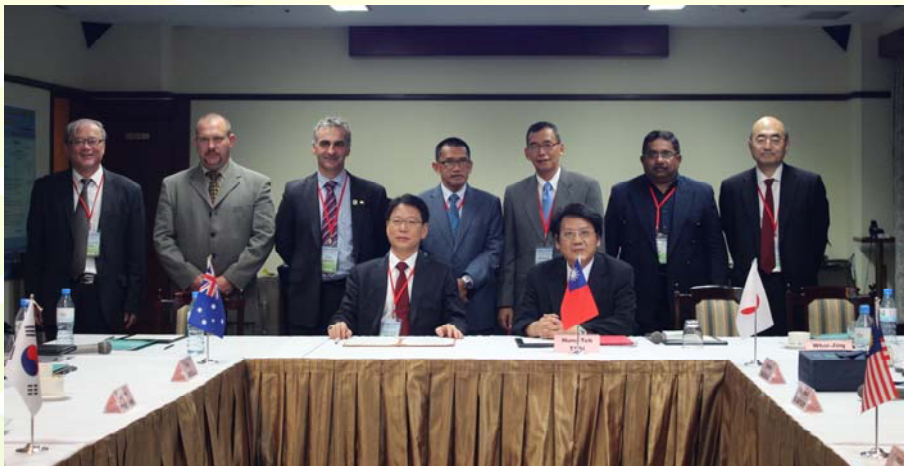
Discussion Item 2: Experience sharing on creating a special funding or seeking budgets for soil and groundwater remediation

Discussion Item 3: Discussion on strengthening the bilateral or multi-lateral cooperation among the member countries of the Working Group to promote the sustainable management of contaminated sites in the Asia and Pacific Region

7. Authorizing the steering committee of the ReSAG Working Group to discuss and implement the reform of the ReSAG Working Group to the Asia and Pacific Partnership for Contaminated Site Management (APPCSM).
8. The members will meet at least in annual basis and the director general meeting will be held in biennial basis. Considering the geographical location and the ease for members, TEPA will host the biennial director general (or above) meeting in Taiwan indefinitely.
9. Restructure the existing ReSAG Working Group web-based information platform to enhance the exchange network functionality. The restructured platform shall be completed by the next director general meeting in 2016.

Minutes of Director General Summit Meeting on Site Remediation The ReSAG Working Group continued

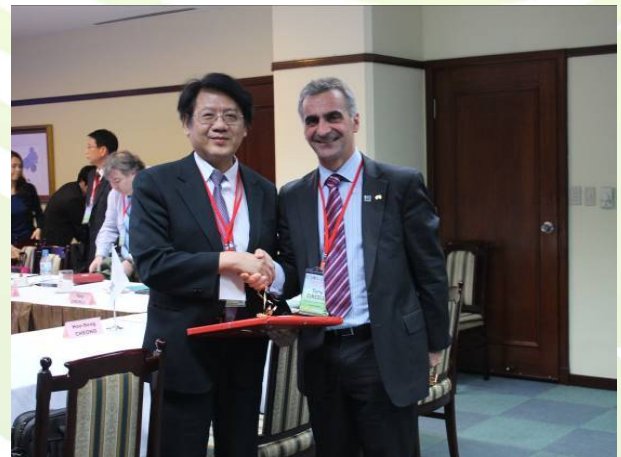
10. The direct generals of environmental protection administration entities from Taiwan, Japan, Korea and Sri Lanka signed the “Taipei Statement on Asia and Pacific Partnership for Contaminated Site Management”.



Interesting Sidelights at Director General Summit Meeting on Site Remediation



Interesting Sidelights at Director General Summit Meeting on Site Remediation continued



Interesting Sidelights at Director General Summit Meeting on Site Remediation continued

Welcome Dinner Party at Howard Plaza Hotel Taipei (臺北福華大飯店) on November 25, 2014



Interesting Sidelights at Director General Summit Meeting on Site Remediation continued

Welcome Dinner Party at Howard Plaza Hotel Taipei (臺北福華大飯店) on November 25, 2014



Interesting Sidelights at Director General Summit Meeting on Site Remediation continued

Gala Dinner at Peng-Yuan restaurant (彭園餐廳) on November 27, 2014



Interesting Sidelights at Director General Summit Meeting on Site Remediation continued

Gala Dinner Party at Peng-Yuan restaurant (彭園餐廳) on November 27, 2014



Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Nov 26 (Wed)	08:00-09:30	Registration			
	09:30-10:00	Opening Ceremony			
	10:00-10:30	Coffee Break			
	10:30-11:20	Plenary Session: Keynote Speech 1 Sustainable Development and Management of Brownfields (Prof. Dr. Rao Surampalli)			
	11:20-12:10	Plenary Session: Keynote Speech 2 Risk Based Contaminated Land Management (Prof. Dr. Paul Nathanail)			
	12:20-13:30	Lunch			
		Room	504-A	504-B	504-C
	13:30-15:10	S1: Sustainable Remediation (1) Moderator: Dr. Shih-Cheng Pan (潘時正)	S3: Remediation of Organic Pollutants (1) Moderator: Prof. Dr. Gordon. C. C. Yang (楊金鐘)	S5: Health Risk-based Remediation Technology (1) Moderator: Prof. Dr. Lambert L. Ding (丁力行)	
	15:10-16:00	Coffee Break & Poster Discussion			
	16:00-17:00	S2: Sustainable Remediation (2) Moderator: Dr. Shih-Cheng Pan (潘時正)	S4: Remediation of Organic Pollutants (2) Moderator: Prof. Dr. Gordon. C. C. Yang (楊金鐘)	S6: Health Risk-based Remediation Technology (2) Moderator: Prof. Dr. Lambert L. Ding (丁力行)	
Nov 27 (Thu)	08:00-09:00	Registration			
	09:00-10:40	S7: Sustainable Remediation (3) Moderator: Prof. Dr. Colin S. Chen (陳士賢)	S9: Remediation of Organic Pollutants (3) Moderator: Prof. Dr. Ting-Nien Wu (吳庭年)	S11: Sampling, Monitoring and Evaluation of site (1) Moderator: Prof. Dr. Chitsan Lin (林啟燦)	
	10:40-11:10	Coffee Break			
	11:10-12:10	S8: Sustainable Remediation (4) Moderator: Prof. Dr. Colin S. Chen (陳士賢)	S10: Remediation of Organic Pollutants (4) Moderator: Prof. Dr. Ting-Nien Wu (吳庭年)	S12: Sampling, Monitoring and Evaluation of site (2) Moderator: Prof. Dr. Chitsan Lin (林啟燦)	
	12:10-13:30	Lunch			

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

	Room	504-A	504-B	504-C
Nov 27 (Thu)	13:30-15:10	S13: Environmental Forensics Moderator: Prof. Dr. Kuei-Jyum Yeh (葉桂君)	S14: Remediation of Heavy Metals (1) Moderator: Prof. Dr. Dar-Yuan Lee (李達源)	S16: Sampling, Monitoring and Evaluation of site (3) Moderator: Mr. Spock Huang (黃建源)
	15:10-16:00	Coffee Break & Poster Discussion		
	16:00-17:00		S15: Remediation of Heavy Metals (2) Moderator: Prof. Dr. Dar-Yuan Lee (李達源)	S17: Sampling, Monitoring and Evaluation of site (4) Moderator: Mr. Spock Huang (黃建源)
Nov 28 (Fri)	08:00-09:00	Registration		
	09:00-10:40	S18: Bioremediation (1) Moderator: Dr. Ming-Daw Che (車明道)	S20: Remediation of Heavy Metals (3) Moderator: Prof. Dr. Zeng-Yei Hseu (許正一)	S22: Sampling, Monitoring and Evaluation of site (5) Moderator: Prof. Dr. Shian-Chee Wu (吳先琪)
	10:40-11:10	Coffee Break		
	11:10-12:10	S19: Bioremediation (2) Moderator: Dr. Ming-Daw Che (車明道)	S21: Remediation of Heavy Metals (4) Moderator: Prof. Dr. Zeng-Yei Hseu (許正一)	
	12:10-13:30	Lunch		
	13:30-15:10	S23: Bioremediation (3) Moderator: Dr. Chih Huang (黃智)	S24: Remediation of Heavy Metals (5) Moderator: Prof. Dr. Yong Sik OK	
	15:10-15:40	Coffee Break		
	15:40-16:30	Closing Ceremony		

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 26 (Wed)

Location: Room 504

Time	Speaker	Topics
08:00-09:30	Registration	
09:30-09:35	Opening address by chairman, Prof. Dr. Zueng-Sang Chen	
09:35-09:40	Opening address by Deputy Minister, Mr. Tzi-Chin Chang	
09:40-10:00	Group photo	
10:00-10:30	Coffee Break	
10:30-11:20	Prof. Dr. Rao Surampalli	Keynote Speech 1 : Sustainable Development and Management of Brownfields
11:20-12:10	Prof. Dr. Paul Nathanail	Keynote Speech 1 : Risk Based Contaminated Land Management
12:10-13:30	Lunch	

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 26 (Wed)

Location: Room 504-A

Session S1: Sustainable Remediation (1)

Moderator: **Dr. Shih-Cheng Pan** (潘時正)

Time	Speaker	Topics
13:30-14:10	Prof. Dr. Jonathan Smith*	Sustainable Remediation: Incorporating sustainability into risk-based soil and groundwater management projects
14:10-14:40	Pei-San Lee 李佩珊	[SR-O-1] Brownfields Screening, Redevelopment Planning and Prioritization Process Promoting in Taiwan
14:40-15:10	Andrew Pruszinski	[SR-O-2] Vapour (TCE) intrusion and the relocation of people from their homes – the cause, the relocation, the science, the outrage
15:10-16:00	Coffee Break & Poster Discussion	

Session S2: Sustainable Remediation (2)

Moderator: **Dr. Shih-Cheng Pan** (潘時正)

Time	Speaker	Topics
16:00-16:40	Mr. Jonathan Meier*	Challenges in implementing groundwater remedial technologies in Asia with case studies from Japan: Permeable Reactor Barrier (PRB) and In-Situ Thermal Remediation (ISTR)
16:40-17:10	Ben B.J. Shiau	[SR-O-3] Advances in Surfactant Enhanced Aquifer Remediation: Lessons Learned and New Trend

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 26 (Wed)

Location: Room 504-B

Session S3: Remediation of Organic Pollutants (1)

Moderator: Prof. Dr. Gordon C. C. Yang (楊金鐘)

Time	Speaker	Topics
13:30-14:10	Mr. Jeffrey D. TeGrotenhuis*	Containment and Bioreactor, Wetlands, or Ion Exchange Resin Ex-Situ Treatment to Facilitate In-Situ Remediation
14:10-14:40	Chih Huang 黃智	[RO-O-1] Groundwater Circulation System for CVOC Contaminated Groundwater in Taiwan-Case Study
14:40-15:10	Lo Tsui 崔碩	[RO-O-2] Applying Compost Liquid as Surfactant Flushing Agent for Enhancing Removal of Groundwater PCE
15:10-16:00	Coffee Break & Poster Discussion	

Session S4: Remediation of Organic Pollutants (2)

Moderator: Prof. Dr. Gordon C. C. Yang (楊金鐘)

Time	Speaker	Topics
16:00-16:40	Khalilalrahman Dehvari	[RO-O-3] Degradation of TNT, RDX, and HMX Explosives using Permeable Zero Valent Iron Nanoparticles Barrier
16:40-17:10	Yu-Huei Peng 彭優慧	[RO-O-4] Adsorption and sequential degradation of brominated flame retardants with zerovalent iron

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 26 (Wed)

Location: Room 504-C

Session S5: Health Risk-based Remediation Technology (1)

Moderator: Prof. Dr. Lambert L. Ding (丁力行)

Time	Speaker	Topics
13:30-14:10	Dr. Karin Guiguer*	Ecological Risk Assessment under Canada Federal Contaminated Sites Action Plan - Steeves Lake, Colomac Mine Example
14:10-14:50	Dr. Rebecca Chou*	Low-Threat Underground Storage Tank Case Closure Policy in California
14:50-15:10	Hsiao-Wei Chang 張筱薇	[HR-O-1] The Improvement of Transformer Insulation Oil Pollution Site
15:10-16:00	Coffee Break & Poster Discussion	

Session S6: Health Risk-based Remediation Technology (2)

Moderator: Prof. Dr. Lambert L. Ding (丁力行)

Time	Speaker	Topics
16:00-16:40	Dr. Sophie Wood*	Assessment of ecological risks in coastal sediments: An Australian oil refinery case study
16:40-17:10	Huei-Shan Lin 林輝山	[HR-O-2] Establishment the system platform of risk management for abandoned factories in Taiwan

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 27 (Thu)

Location: Room 504-A

Session S7: Sustainable Remediation (3)

Moderator: Prof. Dr. Colin S. Chen (陳士賢)

Time	Speaker	Topics
09:00-09:40	Mr. Marc Soellner*	Green and Sustainable Remediation: A Review and an Outlook
09:40-10:10	Tsai-Wen Chiang 蔣在文	[SR-O-4] Green and Sustainable Remediation Development in Taiwan
10:10-10:40	Sheng-Wei Wang 王聖璋	[SR-O-5] Management of groundwater quality in Taiwan
10:10-10:40	Coffee Break	

Session S8: Sustainable Remediation (4)

Moderator: Prof. Dr. Colin S. Chen (陳士賢)

Time	Speaker	Topics
11:10-11:50	Dr. Dora Chiang*	An Overview of the History, Accomplishments, and On-going Initiatives of the Sustainable Remediation Forum (SURF)
11:50-12:10	Charley Wang 王從利	[SR-O-6] Imminent Environmental Remediation in China
12:10-13:30	Lunch	

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 27 (Thu)

Location: Room 504-B

Session S9: Remediation of Organic Pollutants (3)

Moderator: **Prof. Dr. Ting-Nien Wu (吳庭年)**

Time	Speaker	Topics
09:00-09:40	Yang-hsin Shih 施養信	[RO-O-5] Zerovalent iron nanoparticles for the remediation of recalcitrant organic contaminants
09:40-10:10	Kuen-Song Lin 林錕松	[RO-O-6] <i>In-Situ</i> Decontamination of DNAPLs in Groundwater by Polymer-coated Zero-valent Iron Nanoparticles
10:10-10:40	Chih-ping Tso 左致平	[RO-O-7] The reduction of hexabromocyclododecane (HBCD) by zerovalent iron and bimetallic nanoparticle aggregates
10:10-10:40	Coffee Break	

Session S10: Remediation of Organic Pollutants (4)

Moderator: **Prof. Dr. Ting-Nien Wu (吳庭年)**

Time	Speaker	Topics
11:10-11:40	Chau-Yuan Wei 韋朝源	[RO-O-8] Decolorization and mineralization of Congo red with zerovalent iron nanoparticles

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 27 (Thu)

Location: Room 504-C

Session S11: Sampling, Monitoring and Evaluation of site (1)

Moderator: **Prof. Dr. Chitsan Lin** (林啟燦)

Time	Speaker	Topics
09:00-09:40	Pei-Hsuan Yao 姚佩萱	[SME-O-1] The Course of Protecting Agricultural Land from Heavy Metal Pollution in Taiwan
09:40-10:10	Shawntine Lai 賴宣婷	[SME-O-2] The Application of Multi-Increment Sampling to Characterization of Pb on Agricultural Land
10:10-10:40	Yi-Fong Pan 潘毅峰	[SME-O-3] Impact of natural organic matter on the redox reaction of arsenic in water
10:40-11:10	Coffee Break	

Session S12: Sampling, Monitoring and Evaluation of site (2)

Moderator: **Prof. Dr. Chitsan Lin** (林啟燦)

Time	Speaker	Topics
11:10-11:40	Hui-Ping Chuang 莊蕙萍	[SME-O-4] Application of qPCR for Detection of Dehalococcoides sp. in Groundwater Contaminated with Chlorinated Compounds
11:40-12:10	Chia-Hsing Lee 李家興	[SME-O-5] Prediction of Cu and dissolved organic carbon (DOC) sorption onto kaolinite in field pH range
12:10-13:30	Lunch	

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 27 (Thu)

Location: Room 504-A

Session **S13: Environmental Forensics**

Moderator: **Prof. Dr. Kuei-Jyum Yeh (葉桂君)**

Time	Speaker	Topics
13:30-14:10	Dr. Jun Lu*	Environmental Forensics and Remedial Site Investigations
14:10-14:40	Sandy Fan 范惠茹	[EF-O-1] Identifying the Source of Heavy Metals Contaminated in Farmlands and Cases Sharing
14:40-15:10	Anita Lin 林慧娟	[EF-O-2] Application of Geographic Information System to Soil and Groundwater Contamination Management
15:10-16:00	Coffee Break & Poster Discussion	

RESAG

Program of 2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites continued

Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 27 (Thu)

Location: Room 504-B

Session **S14: Remediation of Heavy Metals (1)**

Moderator: **Prof. Dr. Dar-Yuan Lee (李達源)**

Time	Speaker	Topics
13:30-14:10	Prof. Dr. Nanthi Bolan*	Remediation of Heavy Metal(loid)s Contaminated Soils – to Mobilize or to Immobilize?
14:10-14:40	Zeng-Yei Hseu 許正一	[HM-O-1] Effects of Remediation Train Sequence on Decontamination of Heavy Metal-contaminated Soil Containing Mercury
14:40-15:10	Dar-Yuan Lee 李達源	[HM-O-2] Arsenic release into soil solution and accumulation by paddy rice grown in As-contaminated soils as affected by organic matter application
15:10-16:00	Coffee Break & Poster Discussion	

Session **S15: Remediation of Heavy Metals (2)**

Moderator: **Prof. Dr. Dar-Yuan Lee (李達源)**

Time	Speaker	Topics
16:00-16:40	Tai-Hsiang Huang 黃泰祥	[HM-O-3] Water Management to Reduce the Arsenic Content of Brown Rice for Different As-Contaminated Soils
16:40-17:10	T. Y. Yeh 葉琮裕	[HM-O-4] The Improvement of Phytomediation on the Treatment Effectiveness of Heavy Metals with Energy Sunflower Plants with Calcium Peroxide and Phytohormones

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Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 27 (Thu)

Location: Room 504-C

Session **S16: Sampling, Monitoring and Evaluation of site (3)**

Moderator: **Mr. Spock Huang (黃建源)**

Time	Speaker	Topics
13:30-14:10	Chien-Cheng Kuo	[SME-O-6] Assessment of Acute Toxicity of Explosives in the Environment
14:10-14:40	Tsai-Ping Lee 李在平	[SME-O-7] Evaluation of Preferential Groundwater Flow Using the Heat-pulse Flowmeter at a Contamination Site
14:40-15:10	Yu-Jen Huang 黃裕仁	[SME-O-8] Evaluation of anaerobic reductive dechlorination of trichloroethene by using laboratory scale columns
15:10-16:00	Coffee Break & Poster Discussion	

Session **S17: Sampling, Monitoring and Evaluation of site (4)**

Moderator: **Mr. Spock Huang (黃建源)**

Time	Speaker	Topics
16:00-16:40	Jiann-Long Chen 陳建隆	[SME-O-9] Simulating the Effect of Infiltration from River on Groundwater Quality

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Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 28 (Fri)

Location: Room 504-A

Session **S18: Bioremediation (1)**

Moderator: **Dr. Ming-Daw Che (車明道)**

Time	Speaker	Topics
09:00-09:40	Dr. Kung-Hui Chu*	Microbial Biodegradation of Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
09:40-10:10	Chih-Jen Lu 盧至人	[BR-O-1] Aerobic Biodegradation of Dichloroethene in Simulated Groundwaters
10:10-10:40	Martin Slooijer	[BR-O-2] Biological Chlorobenzene Remediation
10:40-11:10	Coffee Break	

Session **S19: Bioremediation (2)**

Moderator: **Dr. Ming-Daw Che (車明道)**

Time	Speaker	Topics
11:10-11:40	John A Dijk	[BR-O-3] Biospeed Concept to Shorten Remediation Time for Chlorinated Ethenes
11:40-12:10	Chin-Shun Kuo 郭進順	[BR-O-4] Biodegradation of 4-monobrominated diphenyl ether with anaerobic microcosms
12:10-13:30	Lunch	

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Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 28 (Fri)

Location: Room 504-B

Session **S20: Remediation of Heavy Metals (3)**

Moderator: **Prof. Dr. Zeng-Yei Hseu (許正一)**

Time	Speaker	Topics
09:00-09:40	Prof. Jae E. Yang*	Beneficial Use of Coal Combustion Residuals for the Sustainable Land Remediation in Korea
09:40-10:10	Chia-Hsing Lee 李家興	[HM-O-5] The effects of adding husk on arsenic concentration of brown rice grown in two poor-drained arsenic-contaminated soils
10:10-10:40	Woo-Chang Kang	[HM-O-6] An Online Monitoring System using Sulfur Oxidizing Bacteria for Detection of Toxic Chemicals in Stream Water
10:40-11:10	Coffee Break	

Session **S21: Remediation of Heavy Metals (4)**

Moderator: **Prof. Dr. Zeng-Yei Hseu (許正一)**

Time	Speaker	Topics
11:10-11:50	Mr. Ed Norrena*	Mine Remediation Training and Employment In Canada's North
11:50-12:10	Gordon. C. C. Yang 楊金鐘	[HM-O-7] Remediation of an Actual Mercury-Contaminated Soil Using the Iodide-Assisted Electrokinetic Process
12:10-13:30	Lunch	

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Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 28 (Fri)

Location: Room 504-C

Session **S22: Sampling, Monitoring and Evaluation of site (5)**

Moderator: **Prof. Dr. Shian-Chee Wu (吳先琪)**

Time	Speaker	Topics
09:00-09:40	Chia-Hsin Li 李佳欣	[SME-O-10] Development of Early-warning Lights Classification Management System for Industrial Parks
09:40-10:10	Ting-Nien Wu 吳庭年	[SME-O-11] Comparison of Membrane Interface Probe and Laser Induced Fluorescence on Site Pollution Investigation and Assessment
10:10-10:40	Chiling Chen 陳琦玲	[SME-O-12] Inorganic Nitrogen Distribution in Groundwater in Southwestern Taiwan and Strategies to Prevent Its Contamination
10:40-11:10	Coffee Break	

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Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 28 (Fri)

Location: Room 504-A

Session **S23: Bioremediation (3)**

Moderator: **Dr. Chih Huang (黃智)**

Time	Speaker	Topics
13:30-14:10	Dr. Kazuhiro Takagi*	Recent progress in bioremediation study of POPs-contaminated soil
14:10-14:40	Huifeng Shan	[BR-O-5] PeroxyChem's Chemical and Biological Remediation Technologies and Applications at Challenging Sites in China
14:40-15:10	Chitsan Lin 林啟燦	[BR-O-6] Application of Compost Tea for the Treatment of Diesel Contamination by Soil Washing
15:10-15:40	Coffee Break	
15:40-16:30	Closing Ceremony	

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Date: November 26-28, 2014

Venue: Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Date: November 28 (Fri)

Location: Room 504-B

Session **S24: Remediation of Heavy Metals (5)**

Moderator: **Prof. Dr. Yong Sik OK**

Time	Speaker	Topics
13:30-14:10	Prof. Dr. Yong Sik OK*	The role of biochar, natural iron oxides and nanomaterials as soil amendments for immobilizing metals in shooting range soil
14:10-14:40	Chiling Chen 陳琦玲	[HM-O-8] Arsenic distribution in groundwater in southwestern Taiwan and evaluation of removal methods
14:40-15:10	Chien-Hui Syu 許健輝	[HM-O-9] Effect of soil As concentrations and genotypes on As content and speciation in grains of rice grown in As-elevated paddy soils
15:10-15:40	Coffee Break	
15:40-16:30	Closing Ceremony	

Seminar Report – Opening Remarks

2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites

09:35 - 09:40, November 26, 2014

Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



Mr. Hung-Teh Tsai (蔡鴻德)

Steering Committee Member of WG ReSAGPAPR

Executive Secretary

Soil and Groundwater Remediation Fund Management Board

Environmental Protection Administration, Taiwan

Good morning, Distinguished invited speakers and participants, ladies and gentlemen:

There is a Chinese proverb that says, “It is such a pleasure to have friends coming from afar.” On behalf of the Taiwan Environmental Protection Administration, I would like to welcome all of you, including 17 invited speakers from 10 countries, 9 Director Generals from Ministry of Environmental Protection or Ministry of Environment and Natural Resources of Asian and Pacific Region, 12 Steering Committee Members of the Working Group of ReSAGPAPR, and near 700 participants from 17 countries, to join this international conference to celebrate our 14th anniversary of the promulgation of the Soil and Groundwater Remediation Act in Taiwan. To our foreign friends, I sincerely hope you will have a wonderful time and an experience to feel the Taiwanese hospitality in next few days.

Our government has recognized the problem of soil pollution since it was discovered cadmium-contaminated rice in 1983. Since then, more and more soil and groundwater contaminated sites have been found. As a result, the Taiwan EPA started to draft our own regulations to manage soil and groundwater pollution in 1991. After 9 years of efforts, the Soil and Groundwater Remediation Act was promulgated on February 2, 2000. And on February 3 in 2010, our legislative Yuan passed a major amendment of this ACT and added the sediments as the additional environmental resources to be protected.

This Act allows us not only to establish regulations to protect our soil and groundwater

resources but also collect the fees from the importers and manufacturers of the announced potential polluted substances to establish the Soil and Groundwater Remediation Fund for conducting investigation and remediation work. Now, we have collected more than 0.1 billion US dollars for the fund and our target is 1 billion US dollars in the future.

Although we have ordered the polluters to clean up the land they polluted, many sites still have not completed cleaned yet due to the limitation of technology and budget. The information of soil and groundwater quality collected from the investigations was stored in a GIS system. We are also planning to produce a health risk map which will be generated by using the information in the database. This information will show a property's human health risk level evaluated from the soil and groundwater quality information collected from the environmental parameters related to the risk assessment models.

Innovative and cost-effective technologies have been developed and applied in the contaminated sites of Taiwan, such as thermal desorption to vaporize and then capture pollutants, inoculating microorganisms to decompose the organic pollutants, or carrying pollutants out of the ground water by air sparging are often applied in Taiwan.

The cost-effective professional technologies are therefore in great demand. Many universities in Taiwan are offering the remediation technologies on soil and groundwater pollution sites for Master's or Ph.D. degree programs. Many universities have also established the Environmental Research Centers for developing the innovative remediation technologies. New investigation tools have been developed and utilized in laboratory level, pilot scale and field scale.

The next steps and goals of our future works are to develop the green and sustainable remediation strategies and risk-based approach remediation technologies for the contaminated sites, to protect our land by rigorously carrying out the regulations, to provide training courses of advance technologies for our professionals, and to share our technologies and experiences with other countries in our Asian and Pacific regions.

I would like to express my appreciation to the foreign experts from American region, European Union and also Asian and Pacific regions. In the last decade, all of you have

continuously supported us every step of the way to share your knowledge and experiences in regulations, technologies and management strategies for the contaminated sites in Taiwan. Especially, some of you have shared your experiences through our annual training workshop on site remediation. I look forward to continuously working together with our foreign friends to build a better and cleaner world.

Lastly, I would like to thank all the invited speakers and near 700 participants from 17 countries. I hope you'll enjoy the conference and exhibition and also study tour after the conference in Taipei and also in central and southern Taiwan in next few days.

Thank you.



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USA

Rao Surampalli

Professor

University Nebraska

Topic:

Sustainable Development and Management of Brownfields

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight, and takes development pressures off green spaces and working lands. The Brownfields Program of the United States Environmental Protection Agency (EPA) empowers states, communities, and other stakeholders to work together to prevent, assess, safely clean up, and sustainably reuse brownfields. Revitalizing brownfield sites creates benefits throughout the community. Through fiscal year 2013, on average, \$17.79 was leveraged for each EPA Brownfields dollar and 7.3 jobs leveraged per \$100,000 of EPA Brownfields funds expended on Assessment, Cleanup, and Revolving Loan Fund cooperative agreements. Brownfields sites tend to have greater location efficiency than alternative development scenarios. Results of five pilot studies show a 32 to 57 percent reduction in vehicle miles travelled when development occurred at a brownfield site rather than a green field. Fewer vehicle miles traveled mean a reduction in pollution emissions including greenhouse gases. These same site comparisons show an estimated 47 to 62 percent reduction of storm water runoff for brownfield site development. Another EPA study found that residential property values increased by 5.1–12.8% percent once a nearby brownfield was assessed or cleaned up. The study determined that brownfield clean up can increase overall property values within a one-mile radius by \$0.5 to \$1.5 million. Initial anecdotal surveys indicate a reduction in crime in recently revitalized brownfield areas. Opportunity to expand the assessment program and leverage funds and jobs has increased. Policy analysis allows the use of site assessment dollars for environmental assessments in conjunction with efforts to promote area-wide planning around brownfield sites. The use of funds for these purposes is particularly important in economically distressed areas. In certain instances where assessments reveal immediate threats to the environment or human health, EPA could implement a more programmatic use of removal funds.

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UK

Paul Nathanail

Professor

University of Nottingham

Topic:

Risk Based Contaminated Land Management

- **Understand the risk:**

Risk = hazard * vulnerability

Risk = probability * consequence

Risk = Source potency * pathway transmissivity * receptor susceptibility

- **Manage the risk:**

- Remove, destroy, detoxify the source or

- Interrupt the pathway or

- Modify the land use or

- Protect, exclude the receptor

- **What is “Contaminated land”?**

Formal definition of Statutory Contaminated Land: Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substance in, on or under the land that – (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.

- **The Methods & Process of “Risk based contaminated land management”:**

- Process: Determine Legislative Context → Hazard Identification → Hazard Assessment → Risk Estimation → Risk Evaluation

- Method: Conceptual site model

- 7 Principles:

(1) Every risk assessment is a site specific risk assessment, (2) The legal or policy context is the starting point, (3) You can't manage what you don't understand, (4) Begin with a qualitative risk assessment, (5) Don't save money at the site investigation stage; save it at the remediation stage, (6) Write for your reader not your lawyer and (7) Effective regeneration prepares places for people.

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USA

Dora Chiang

Associate Vice Presiden

AECOM

Topic:

An Overview of the History, Accomplishments, and On-going Initiatives of the Sustainable Remediation Forum (SURF)

Over the last decade, many sectors of industrialized society have been rethinking behavior and re-engineering practices to reduce consumption of energy and natural resources. The Sustainable Remediation Forum (SURF) promotes the use of sustainable practices during the investigation, construction, redevelopment, and monitoring of remediation sites, with the objective of balancing economic viability, conservation of natural resources and biodiversity, and the enhancement of the quality of life in surrounding communities. Since its founding in 2006, SURF has brought together the best and the brightest in the remediation field, and has led the evolution of sustainable remediation (SR) from conceptual discussions to standard operating procedure. The mission of SURF is to maximize the overall environmental, societal, and economic benefits of the site cleanup process. SURF was the first to consolidate broad-based institutional knowledge into an exploration of SR drivers, practices, objectives, and case studies. SURF's groundbreaking White Paper was published in a special edition of the Summer 2009 Remediation Journal. SURF has continued to expand on the topics explored in the White Paper, including publications on its SR framework, metrics compendium, life cycle assessment guidance, and a call to improve the integration of land remediation and reuse. SURF's current efforts focus on groundwater conservation and reuse, international collaboration on SR, and ways to capture and evaluate the socio-economic benefits of contaminated site cleanup. SURF's ongoing objective is to provide a forum for representatives of government, industry, consultancy, and academia to parse the means and ends of incorporating societal and economic considerations into environmental cleanup projects. SURF collaborates, educates, advances, and develops consensus on the application of sustainability concepts throughout the lifecycle of remediation projects, from site investigation to closure, and eventually reuse of the property. SURF members accomplish these objectives through volunteer working groups.

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Canada

Ed Norrena

Senior Advisor

Air Quality, Climate Change, Sustainability, and
Government Relations,
SNC-Lavalin Environment

Topic:

Mine Remediation Training and Employment In Canada's North

Canada's North is plagued with a number of Contaminated Mine Sites from open discharges to freshwater lakes, streams, and rivers. Together with this, one will find aboriginals who are having great difficulty finding work because of the nature of the work available and the difficulty of finding skills available. A number of organizations including various levels of government, and a number of private sector engineering firms were brought together by the Environmental Careers Organization Canada (ECO) under the direction of Grant Trump, CEO of ECO to determine a solution.

RESAG

Seminar Report – Invited Speakers continued

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Korea

Jae E. Yang

Professor of Kangwon National University

Former President of International Union of Soil Science

Topic:

Beneficial Use of Coal Combustion Residuals for the Sustainable Land Remediation in Korea

Lands nearby abandoned mines are exposed to various types of mine hazards in Korea. Soil is susceptible to heavy metal contamination with erosion of mine wastes and use of mine water as an irrigation source. Alternative option for soil remediation is critically needed in the abandoned mine area being located in the steep valley. Coal combustion residuals (CCR) from power plants are alkaline resources that have potential to be beneficially used for land remediation. Objective of this research was to assess the possibility of CCRs to remediate the metal contaminated lands. The segment plots were constructed in the coal waste heap that has 56% of slope and size was 30x3m (LxW). Varied ratio (20 and 40%) of CCR was mixed or layered with mine waste. pH and heavy metal concentration in soil, runoff and leachate were periodically monitored. After treating the plot with CCR, the surface was hydro-seeded to cover the surface with native grass species. Growth vigor and surface cover of the grasses were assessed. CCRs neutralized the soil, runoff and leachate from pH 4 to 7. Concentrations of metal such as As, Al, and Fe were significantly reduced in soil and water samples with CCR application. As mixing ratio of coal ash with mine waste is increased, more growth of plants was observed. Results suggest that CCR can be utilized to remediate mine waste due to high efficiency in increasing pH, stabilizing the heavy metals and enhancing the vegetative covers in the mine-impacted land. Reuse of CCR as a remedial resource, being coupled with adopting environmental parameters specific to the land, can be a sustainable method for land remediation.

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USA

Jeffrey D. TeGrotenhuis

Principal Remediation Engineer

MWH Global, Inc.

Topic:

**Containment and Bioreactor, Wetlands,
or Ion Exchange Resin Ex-Situ Treatment
to Facilitate In-Situ Remediation**

It is often impractical to remove a sufficient amount of contaminant mass to achieve drinking water standards at properties containing either a large amount of contaminant mass and/or over a large areal extent. Similarly, decades may be required before the risks to humans or the environment are fully removed. During this period, isolation of the chemicals from the potential receptors, containment, may be the only viable alternative. The methods of implementing containment can vary widely, and some can enhance the implementation of other remedies that accelerate contaminant mass removal.

This paper evaluates two sites in MWH's portfolio where containment was used in traditional applications but where the composition of the extracted water required creative solutions to provide cost-effective long-term treatment. One site uses a combination of a high density polyethylene (HDPE) barrier, extraction trenches, and activated sludge water treatment. Dewatering afforded an opportunity to remove containment mass by soil vapor extraction (SVE). The other site uses a soil and bentonite wall, wells, and will use a membrane bioreactor (MBR) to treat a spectrum of chemicals.

Four sites are also discussed where containment was or is being used to safely implement in-situ treatment. Three of the sites share a common contaminant, hexavalent chromium; common approach, in-situ chemical reduction (ISCR) using calcium polysulfide (CaS_x); and vertical well extraction with recirculation; however, the method of ex-situ treatment and in-situ delivery vary, including direct chemical reduction or ion exchange (IX) and infiltration basins, trenches, or vertical well injection. The fourth site is a former petroleum refinery where interceptor trenches protect a sensitive receptors and an engineered wetland provides low-cost long term water treatment. A component of the remedy is phytoremediation to accelerate source area treatment.

Lesson's learned include: when to use strong base anion (SBA) versus weak base anion (WBA) exchange resin; how wetlands can provide cost-effective long-term treatment when space is available; how humic substances can interfere with analysis and methods to remove them; how groundwater extraction and reinjection can be used to enhance in-situ treatment; and how the composition of total organic carbon (TOC) can vary and its impact on treatment equipment.

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Japan

Jonathan Meier

Partner, ERM-Japan

Technical Director

Contaminated Site Management (CSM) Group

Topic:

Challenges in implementing groundwater remedial technologies in Asia with case studies from Japan: Permeable Reactor Barrier (PRB) and In-Situ Thermal Remediation (ISTR)

Clients based in environmentally more mature jurisdictions such as North America, Europe, and Australia often face challenges in properly characterizing industrial sites and implementing innovative and technically robust soil and groundwater remedial technologies in Asia. The reasons are many but broadly include lack of experienced contractors, site characterization tools, access to laboratories, differences in technical specifications / codes and permitting, language barriers, differences in business styles and contracting, remoteness / logistics, climate, import restrictions, political environment, differences in and/or lack of environmental regulations and standards, absence of risk assessment methodologies, and lack of experienced regulatory officials.

These challenges can be overcome, however, through careful planning, iterative high resolution site characterization using imported tools, scientifically robust feasibility studies, use of modeling (probabilistic, fate and transport, thermal), detailed design which accounts for a local delivery, and early engagement with regulatory officials and other stakeholders.

Environmental Resources Management has been remediating contaminated land sites in Asia for over 20 years. This paper will present delivery on two recent projects in Japan where we implemented the installation of a 300m long Permeable Reactive Barrier (PRB) wall and construction of a steam enhanced In-Situ Thermal Remediation (ISTR) system, the challenges we faced, and how we overcame such barriers in delivering these innovative technologies for our clients.

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UK

Jonathan Smith

Hydrogeologist

Shell Global Solution (UK) Ltd

Topic:

Sustainable Remediation: Incorporating sustainability into risk-based soil and groundwater management projects

In the past decade management of historically contaminated land has largely been based on prevention of unacceptable risks to human health and the environment, to ensure a site is 'fit for use'. More recently interest has been shown in including sustainability as a decision-making criterion. Sustainability concerns include the environmental, social and economic consequences of risk management activities themselves, and also the opportunities for wider benefit beyond achievement of risk-reduction goals alone. In the UK this interest has led to the formation of a multi-stakeholder initiative, the UK Sustainable Remediation Forum (SuRF-UK). This paper presents a framework for assessing 'sustainable remediation'; describes how it links with the relevant regulatory guidance; reviews the factors considered in sustainability; and the appraisal tools that have been applied to evaluate the wider benefits and impacts of land remediation. The paper also describes how the framework relates to recent international developments including emerging European Union legislation and policy. A large part of this debate has taken place in the "grey" literature which we review. It is proposed that a practical approach to integrating sustainability within risk-based contaminated land management offers the possibility of a substantial step forward for the remediation industry, and a new opportunity for international consensus.

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USA

Jun Lu

Principal Technical Specialist
AECOM

Topic:

Environmental Forensics and Remedial Site Investigations

Environmental forensics is the investigation that is focused on identifying potential contaminant source(s) at a contaminated site using legally defensible methodologies. Contaminant source issues arise from various contexts (e.g., on-site vs. offsite and historical vs. recent), but at their core they revolve around the identification of primary sources (i.e., points or areas of original releases) and secondary sources (i.e., derived from primary sources). At sites where there are disputes on the contaminant sources, remedial costs are often allocated among potential responsible parties (PRPs). Cost allocation is complex and depends on many other factors such as volume of contaminants, time of operation involving the contaminants, risk associated with the contaminants and contribution of contaminant sources requiring remediation (Marryott, et al., 2000; Murphy, 2000; USEPA, 2000, Owete, 2007). However, identification of primary and secondary sources is one of the most critical elements in the process as it is the foundation for all other cost related assessments.

In environmental remedial site investigations, the ultimate objective is to determine the nature and extent of contamination (i.e., currently impacted areas). The contaminant source issues from a legal standpoint are of as much interest to site remedial scientists and engineers because contaminant sources need to be well understood in order to develop a sound conceptual site model (CSM). In a CSM, contaminant sources and release migration pathways are among the two most critical components (Lu, 2015). In a site where contaminant sources are known and geology and hydrogeology (i.e., release migration pathways) are well understood, delineation of the currently impacted areas can be done with high certainty. However, in a site where knowledge of site release history is incomplete and geology and hydrogeology is complex, delineation of the currently impacted areas is extremely challenging. In this case, identification and characterization of contaminant sources will provide critical information in predicting release migration pathways and ultimately understanding and/or delineating the currently impacted areas. Environmental forensic techniques have been developed over a long history of litigation (Morrison, 2000; Sullivan et al., 2000; Morrison and Murphy, 2006; Wang et al., 2007; Murphy and Morrison, 2015). Validity of most of these techniques is established as they are not only published in peer reviewed scientific journals, but also have been critically evaluated and vigorously scrutinized during the litigation process. Environmental forensic techniques are contaminant specific; but can be generalized into a number of categories including aerial photography, chemical commercial availability and use, fingerprinting, diagnostic compounds and ratio analysis, stable isotope analysis, modeling and statistics. This paper provides an overview of commonly used forensic techniques and presents two case studies to demonstrate application of environmental forensic techniques to source characterization in remedial site investigation.

The first case study demonstrates importance of differentiating current from historical releases using a tiered analytical approach for petroleum hydrocarbon fingerprints. At a petroleum terminal, an aboveground diesel

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storage tank was suspected of leaking following an earthquake, as evident from a two-to three-foot wide area of hydrocarbon stained surface soil along the perimeter of the tank. A forensic investigation was conducted to determine whether soil adjacent to and beneath the tank was impacted from the diesel fuel that may have leaked from the tank.

Twenty-four soil samples were initially analyzed for C7-C27 carbon chain using EPA Method SW8015B. Following review of the analytical results, four out of the 24 soil samples, one diesel fuel sample from the tank and one light non-aqueous phase liquid (LNAPL) sample from a nearby monitoring well were selected for gas chromatography/mass spectrometry (GC/MS) using total ion monitoring (TIM) data acquisition mode. Based on comparison of fingerprints between the hydrocarbons from soil samples, the diesel fuel sample from the tank and the LNAPL sample from the well, the hydrocarbons encountered at the deeper soil beneath the tank were determined to be not sourced from the diesel fuel from the tank; however, uncertainty remained on the source relationship between the diesel in the tank, hydrocarbons in the shallow soils beneath the tank and soils along the perimeter of the tank.

Additional laboratory analyses were conducted using GC/MS selected ion monitoring (SIM) data acquisition mode for polynuclear aromatic hydrocarbons (PAHs) and sesquiterpane biomarkers. Based on detailed forensic analysis, it was concluded that the hydrocarbons in the shallow soils were not related to the diesel fuel in the tank. As the historical impact is being addressed by an on-going remediation program overseen by a regulatory agency, differentiation of historical from current releases avoided unnecessary further investigation.

The second case study is to demonstrate on-site vs. off-site sources. A former manufacturing facility had historic release(s) of tetrachloroethene (PCE) and trichloroethene (TCE) to the subsurface with both on-site and off-site groundwater impacts. Site remediation employed source area removal and groundwater extraction and treatment at the downgradient property boundary. The responsibilities for off-site subsurface impacts (i.e., groundwater, soil vapor and potential indoor vapor intrusion) were disputed by adjacent downgradient property owners who also utilized PCE and TCE for multiple industrial and commercial activities. From a remediation perspective, understanding of potential off-site sources is also critical in development of a strategy for the expeditious clean-up.

To evaluate PCE and TCE source relationship between on-site and off-site, CSIA was included as a part of the investigation process. CSIA has been used extensively for biodegradation evaluation in remedial investigation. It is also applicable for source differentiation because the isotopic composition of manufactured organic compounds depends on the isotope ratio of the source materials and on isotope fractionation during production of the compounds (U.S. EPA, 2008). At sites where multiple potential sources of the same ground water contaminants are present, CSIA is extremely valuable in resolution of source issues. The objectives of the study were to determine 1) isotopic signature of the PCE and TCE in groundwater from the former manufacturing facility and on the adjacent properties; 2) if an off-site source(s) was contributing to the off-site PCE and TCE groundwater plume; 3) if soil gas impacts on adjacent properties were from on-site sources or from off-site activities.

Groundwater samples were collected from 13 on- and off-site monitoring wells and soil gas samples from three locations at five discrete depth intervals per location. These samples were analyzed for two dimensional (2-D) CSIA for PCE and 3-D CSIA for TCE. The analysis of groundwater CSIA data demonstrated that there appear to be one TCE source and several potential PCE sources off site. Soil gas results for PCE correlate with off-site carbon and chlorine isotope signature suggesting three potential off-site sources for PCE. Soil gas results for TCE indicate two off-site TCE sources that are not related to the on-site releases.

In a summary, the study determined that the off-site groundwater plume of PCE, TCE and degradation products is a comingled plume that has resulted from the known on-site releases and received contributions from the off-site sources. With CSIA findings, in conjunction with other investigative data, the local state regulatory body was convinced with the conclusions with regard to multiple off-site contributions to the groundwater plume and no on-site contribution to the offsite soil vapors. Consequently, the focus of remedial investigation has been shifted from onsite to offsite to identify offsite contaminant sources that contribute to groundwater PCE and TCE plume and indoor air pollution.

Seminar Report – Invited Speakers continued

2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites

November 26-28, 2014

Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



Brazil

Karin Guiguer

Principal Consultant

Environmental Resources Management (ERM)

Topic:

Current Approach Used in Canada for Managing Contaminated Sites under the Federal Contaminated Sites Action Plan (FCSAP) – Case Study Example

In 1989, the Canadian Council of Ministers of the Environment (CCME) and the Government of Canada created the National Contaminated Sites Remediation Program (NCSRP) and under this program, a method for classifying contaminated sites according to their current or potential adverse impacts on human health and the environment was developed.

In 1990, Environment Canada committed to assisting custodians with identifying, assessing, and remediating high-risk contaminated sites within their jurisdictions. As a result, 325 federal sites were investigated. The creation of the Contaminated Sites Management Working Group (CSMWG) in 1995 was a major step forward in addressing federal contaminated sites.

The 2002 *Report of the Commissioner of the Environment and Sustainable Development* indicated a need to produce an action plan to deal with high-risk sites in a timely manner. Recognizing the need for a coordinated approach, the government established the Federal Contaminated Sites Action Plan (FCSAP) program in 2005. Under the FCSAP program, assessment activities were conducted at over 9,400 sites and remediation activities at roughly 1,400 sites across Canada.

The focus of this manuscript is to present the current approaches used in Canada for managing contaminated sites under the FCSAP program as well as to present a study case example.

Seminar Report – Invited Speakers continued

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Japan

Kazuhiro Takagi

Upper senior researcher

National Institute for Agro-Environmental Sciences &
Professor

Graduate School of Agricultural Chemistry Tokyo
University of Agriculture

Topic:

**Recent progress in bioremediation study of
POPs-contaminated soil**

Clean-up technology for contaminated soil and water with persistent organic pollutants (POPs) and other pesticides is required. A novel aerobic pentachloronitrobenzene (PCNB)-degrading bacterium, *Nocardioides* sp. strain PD653, was isolated from an enrichment culture in an original soil-charcoal perfusion system. Strain PD653 also degraded hexachlorobenzene (HCB) and β -HCH to CO_2 with dissociation of chloride ions under aerobic conditions. It is the first aerobic bacteria capable of mineralizing HCB. Besides, hexachlorocyclohexane (HCHs)-degrading bacterium (*Sphingomonas* sp. strain TSK-1) and dieldrin-degrading bacterium (*Pseudonocardia* sp. strain KSF27) were isolated from upland soil where γ -HCH or endosulfan had been annually applied, respectively using this system. Strain TSK-1 degraded aerobically α , β , γ , and δ -HCH. Six chloride ions per molecule occurred with completely degradation of α , γ and δ -HCH after 4 and 10 days incubation. For β -HCH, however, two chloride ions per molecule were released with 90% of degradation after 10 days incubation. To apply mixture of these bacteria (PD653 and TSK-1) to contaminated soil, we developed a special charcoal (CC 150) enriched with 2 degrading-bacteria. After mixing 5% this charcoal with historically HCHs-contaminated soil (71.5 mg/kg), approximately 76 % of γ -, 67% of α -, 35% of δ - and 19% of β -HCH were degraded after 2 weeks incubation. Strain KSF27 degraded dieldrin from 14.06 μM to 2.01 μM over a 10-day incubation. As a major metabolite, aldrindicarboxylic acid was detected. Moreover, an aerobic dieldrin-degrading fungus, *Mucor racemosus* strain DDF, was isolated from soil annually treated with endosulfan. Strain DDF degraded dieldrin to 1.01 μM from 14.3 μM during a 10-day incubation. As a dead end product, aldrin-*trans*-diol *exo*- and *endo*-phosphates were detected via aldrin-*trans*-diol. Phosphorylation of aldrin-*trans*-diol is the first reported example of phosphate conjugation in microorganisms. When strain DDF with wheat bran was treated into the historically contaminated soil, dieldrin degraded 47% after 3 weeks incubation.

Seminar Report – Invited Speakers continued

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Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



USA

Kung-Hui Chu

Associate Professor

Texas A&M University

Topic:

**Microbial Biodegradation of
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)**

Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) is a cyclic nitramine explosive that frequently contaminates soils and groundwater near army ammunition plants and military sites. RDX is also a possible human carcinogen. Bioremediation has been considered as a viable option for remediating RDX-contaminated soil and groundwater. In this review, current knowledge of microbial biodegradation of RDX with respect to degradation pathways, degradative genes and isolates, as well as RDX-degrading microbial community in soil and groundwater was discussed.

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Seminar Report – Invited Speakers continued

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November 26-28, 2014

Conference Room 504, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



Germany

Marc Söllner

Senior Environmental Scientist
URS Corporation, Germany

Topic:

Green and Sustainable Remediation: A Review and an Outlook

Green and sustainable remediation (GSR) creates an added benefit to legally required or otherwise necessary remediation of contaminated land to protect human health and the environment. Added benefit increases the value beyond monetary aspects of the remediation project by including additional stakeholders besides the Site owner, environmental consultant and the regulatory entity and considering not only environmental, but also social and economic aspects of the remediation program. While GSR is still an emerging field in the contaminated land management industry, various groups across the globe have dedicated their efforts to advance the understanding of sustainability assessment drivers, improve and develop GSR assessment tools to quantify impacts of various parameters, create a philosophy around the concept of GSR, and develop guidelines how to best implement “sustainability” and maximize the net benefit in remediation projects. In various countries GSR teams developed frameworks and road maps to green & sustainable remediation providing a supporting structure for stakeholders to evaluate on a site-specific basis the aspects of their specific project. The release of frameworks for sustainable remediation within the US, UK and Europe occurred between 2010 and 2012. While those framework documents were crafted based on the same set of ideas and in the same spirit, they are not the same. A single, unified and international sustainable remediation framework would allow practitioners a process-driven guideline that could be implemented in various project settings around the globe. It would allow the flexibility to adjust as needed based on project location, size and complexity of the project, regulatory context, and project-specific stakeholders with their individual needs, and still deliver comparable results for different projects completed under different circumstances “somewhere else” in the world. An internationally accepted certification for sustainable remediation practitioners would lend additional credibility and expertise to the objectivity of the process-driven decision-based outcome of each remedial sustainability assessment.

Seminar Report – Invited Speakers continued

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Australia

Nanthi Bolan

Chair in Environmental Sciences
University of South Australia

Topic:

**Remediation of Heavy Metal(loid)s
Contaminated Soils – to Mobilize or to
Immobilize?**

Unlike organic contaminants, metal(loid)s do not undergo microbial or chemical degradation and persist for a long time after their introduction. Bioavailability of metal(loid)s plays a vital role in the remediation of contaminated soils. In this review, the remediation of heavy metal(loid) contaminated soils through manipulating their bioavailability using a range of soil amendments will be presented. Mobilizing amendments such as chelating and desorbing agents increase the bioavailability and mobility of metal(loid)s. Immobilizing amendments such as precipitating agents and sorbent materials decrease the bioavailability and mobility of metal(loid)s. One of the major limitations of mobilizing technique is susceptibility to leaching of the mobilized heavy metal(loid)s in the absence of active plant uptake. Similarly, in the case of the immobilization technique the long-term stability of the immobilized heavy metal(loid)s needs to be monitored.

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Seminar Report – Invited Speakers continued

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USA

Rebecca Chou

Section Chief of Groundwater Permitting and Land Disposal
Regional Water Quality Control Board – Los Angeles Region
California Environmental Protection Agency

Topic:

**Low-Threat Underground Storage Tank Case
Closure Policy in California**

The State Water Resources Control Board and Regional Water Quality Control Boards have been authorized under California Health and Safety Code and California Code of Regulations to administer the petroleum Underground Storage Tank (UST) Cleanup Program since 1984. A UST Cleanup Fund was established in 1989 to support UST case investigations and cleanups. In order to utilize the fund effectively, many UST regulations and policies were developed to ensure consistency and efficiency, including a low-threat underground storage tank case closure policy effective August 17, 2012. This policy that set up general and media specific case closure criteria using technical justification and screening levels will be described. Implementation procedures of the policy and regulatory tools will also be discussed, including the relevant California Water Code sections and General Waste Discharge Requirements for In-situ Groundwater Remediation and Groundwater Re-injection adopted September 11, 2014.

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Seminar Report – Invited Speakers continued

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Australia

Sophie A. Wood

Partner

ERM Australia Pty Ltd

Topic:

Assessment of ecological risks in coastal sediments: An Australian oil refinery case study

In response to a regulatory requirement for clean-up of an oil refinery site, an ecological risk assessment was conducted to determine whether significant impacts on the intertidal and near shore marine ecology were likely to be occurring. A weight of evidence approach was adopted, employing multiple lines of evidence over a number of years to reach a conclusion on the acceptability of risk. The study included sediment and porewater chemical analysis and ecotoxicity testing, an investigation of benthic macroinvertebrate populations and chemical analysis of tissue samples from sessile organisms. The study design was agreed with the regulator and results communicated over a series of reports and briefing sessions, and was peer reviewed by CSIRO. The work was also subject to third party audit, which is a regulatory requirement of the Australian contaminated land system. The results indicated localized significant toxicity along the foreshore in porewater and sediments affected by LNAPL, but no significant differences in benthic assemblages were observed between impacted and non-impacted locations. Both toxicity and chemical concentrations declined rapidly away from the foreshore, with degradation of petroleum hydrocarbons apparently being driven by wave action in the intertidal zone. No accumulation of hydrocarbons in mussel tissue was detected. In the context of a very well characterized site, and with migration of impacts from the Refinery site under control, the study concluded that remedial action to protect ecosystems was not required, because the benefits to the ecology that could be achieved by removal of impacts would be likely to be insignificant and restricted to a very small area of foreshore. The potential damaging effects of mobilizing contamination over a wider area as a result of a remedial excavation were also considered in reaching this decision. The conclusions of the study were accepted by the regulator.

Seminar Report – Invited Speakers continued

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Korea

Young-Sik Ok

Full Professor and Director
Kangwon National University

Topic:

The role of biochar, natural iron oxides and nanomaterials as soil amendments for immobilizing metals in shooting range soil

Heavy metal pollution of soils is a matter of concern worldwide. High concentration of toxic metals in military shooting range soils poses a significant environmental concern due to the potential release of metals such as Pb, Cu, and Sb, and hence requires remediation. The current study examined the effectiveness of buffalo weed (*Ambrosia trifida* L.) biomass and its biochar produced at pyrolytic temperatures of 300 and 700 °C, natural iron oxides (NRE), gibbsite, and silver nanoparticles on metal immobilization together with soil quality. Contaminated shooting range soils by heavy metals were treated with these amendments and incubated for a year. After incubation, destructive (e.g. chemical extractions), and non-destructive (e.g. molecular spectroscopy) methods were used to investigate the immobilization efficacy of each amendment on Pb, Cu, and Sb, and possible mechanisms. Biochar induced larger increase of cation exchange capacity (CEC) in the soil than the other amendments. The best immobilization was for biochar produced at 300 °C, showing the maximum decreases of bioavailability by 94% Pb and 70% Cu. We attributed this to the greater abundance of functional groups in the biochar. Biochar originated P in the soil, and increased soil pH and CEC. However, no amendment was effective on Sb immobilization. As a non-destructive approach, scanning electron microscopic elemental dot mapping and X-ray absorption fine structure spectroscopic (EXAFS) studies revealed associations of Pb with P (i.e. the formation of stable chloropyromorphite [Pb₅(PO₄)₃Cl]) in the biomass- or biochar-amended soils.

Seminar Report – Question and Discussion

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Prof. Nanthi Bolan
University of South Australia
Australia



Prof. Gordon C. C. Yang
National Sun Yat-Sen University
Taiwan



Mr. Charley Wang
Jiangsu DDBS Environment
Remediation Co., LTD.
China



Mr. Khalilrahman Dehavri
Yuan Ze University
Taiwan



Taiwan



Prof. Paul Nathanail
University of Nottingham
UK



Ms. Hsiao-Wei Chang
Taiwan Power Company
Taiwan



Dr. Sophie A. Wood
ERM Australia
Australia



Mr. Bruce Croucher
Ministry of Environment
New Zealand

Seminar Report – Question and Discussion continued

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Taiwan



Prof. Chitsan Lin
National Kaohsiung
Marine University
Taiwan



Dr. Dora Chiang
AECOM
USA



Mr. Huei-Shan Lin
Apollo Technology Co., Ltd
Taiwan



Taiwan



Dr. Masanori Kobayashi
Yokohama National University
Japan



Taiwan



Dr. Yi-Fong Pan
National Cheng Kung University
Taiwan



Mr. Charles Chou
National Taiwan University
Taiwan

Seminar Report – Question and Discussion continued

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Mr. Andrew Pruszinski
EPA (South Australia)



Prof. Paul Nathanail
University of Nottingham
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Sinotech Environmental
Technology, LTD. Taiwan



Dr. Jang Fang, P.E.
Executive Director
AECOM, Taiwan



Dr. Shih-Cheng Pan
Sinotech Environmental
Technology, LTD.
Taiwan



Mr. Ben Shiau
Uni. of Oklahoma & Taiwan
Surfactant
USA/Taiwan



Prof. Jiann-Long Chen
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Taiwan



Dr. Chia-Hsing Lee
National Taiwan University
Taiwan



Dr. Karin Guiguer
ERM
Brazil

Seminar Report – Question and Discussion continued

2014 International Conference on Remediation and Management of Soil and Groundwater Contaminated Sites

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Prof. Colin S. Chen
National Kaohsiung
Normal University
Taiwan



Prof. Rao Surampalli
University of Nebraska
USA



Mr. Yu-Jen Huang
Sinotech Engineering
Consultants, Inc.
Taiwan



Ms. Hui-Chuan Lin
Geographic Information
Technology Co., Ltd
Taiwan



Prof. Kuei-Jyum Yeh
National Pingtung University of
Science and Technology
Taiwan



Ms. Sandy Fan
Freeair Engineering
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Dr. Sheng-Wei Wang
Sinotech Environmental
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Prof. Kazuhiro Takagi
Tokyo University of Agriculture
Japan



Prof. Yang-Hsin Shih
National Taiwan University
Taiwan

Seminar Report – Question and Discussion continued

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Prof. Jae E. Yang
Kangwon National University
Korea



Prof. Zeng-Yei Hseu
National Pingtung University of
Science and Technology
Taiwan



Mr. Tai-Hsiang Huang
National Taiwan University
Taiwan



Taiwan



Prof. Dar-Yuan Lee
National Taiwan University
Taiwan



Mr. Chau-Yuan Wei
National Taiwan University
Taiwan



Mr. Woo-Chang Kang
Kangwon National University
Korea



Dr. Hao-Chun Hung
Taiwan EPA



Prof. Ting-Nien Wu
Kun Shan University
Taiwan

Seminar Report – Question and Discussion continued

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Mr. Martin Slooijer
BioSoil International
Netherlands



Mr. Achmad Gunawan
Ministry of Environment
Indonesia



Mr. John A Dijk
BioSoil International
Netherlands



Dr. Chien-Hui Syu
Taiwan Agricultural
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Taiwan



Dr. Huifeng Shan
PeroxyChem Environment
Solutions (East Asia)



Mr. Jeffrey D. TeGrotenhuis
MWH Global, Inc.
USA



Dr. Jonathan Smith
Shell Global Solution Ltd.
UK



Dr. Chi-Ling Chen
Taiwan Agricultural
Research Institute
Taiwan



Prof. Shian-Chee Wu
National Taiwan University
Taiwan

Seminar Report –Interesting Sidelights

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Opening Remarks

Prof. Zueng-Sang Chen
Conference Chairman
Taiwan



Opening Remarks

Mr. Hung-Teh Tsai
Taiwan EPA

Seminar Report –Interesting Sidelights continued

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Seminar Report –Interesting Sidelights continued

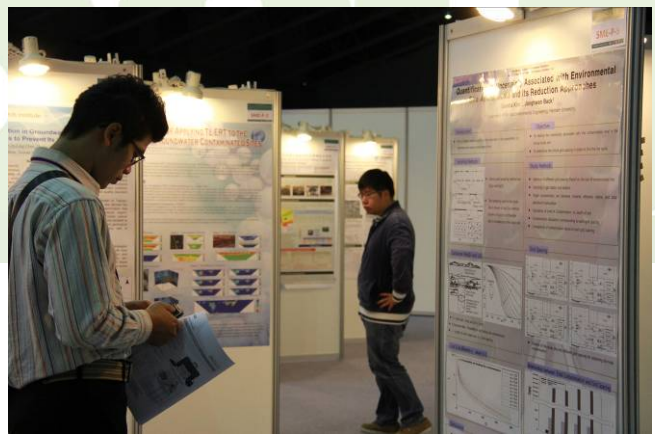
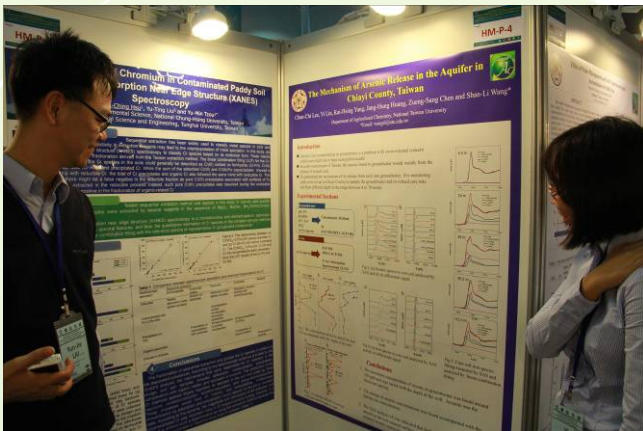
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International Conference Poster Area



Seminar Report –Interesting Sidelights continued

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Seminar Report –Interesting Sidelights continued

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Closing Ceremony



Seminar Report – Opening Remarks

2014 International Soil and Groundwater Exhibition

10:00 - 10:10, November 25, 2014

Area N, 4F, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



Dr. Kuo-Yen Wei (魏國彥)

Minister

Environmental Protection Administration, Taiwan

Dr. Kuo-Yen Wei received his Ph.D. degree from Graduate School of Oceanography, University of Rhode Island. He is the Minister of Environmental Protection Administration (EPA), Executive Yuan, R.O.C. (Taiwan). He is Professor in Department of Geosciences (1994 to now), National Taiwan University (NTU). He is Adjunct Research Fellow in Institute of Earth Sciences, Academia Sinica.

Good morning, Distinguished invited international speakers, Deputy Minister Dr. Malik, 4 Director Generals, Steering Committee members, local participants, ladies and gentlemen:

Good morning, everybody. As the Minister of the Taiwan Environmental Protection Administration, I would like to welcome all of you, including 17 invited speakers from 10 countries, Deputy Minister, Dr. Muhammad Ilham Malik from Indonesia and 4 Director Generals including Mr. Tony Circelli from Australia, Mr. Osami Sagisaka from Japan, Dr. Heo-Seog Cheong, from Korea, and Mr. Yunus bin Abudul Razak from Malaysia.

They are invited from Ministry of Environmental Protection or Ministry of Environment and Natural Resources of Asian and Pacific Region. There are 8 Steering Committee Members of the Working Group of ReSAG, and near 700 participants from 17 countries, to join this international exhibition to celebrate our 14th anniversary of the promulgation of the Soil and Groundwater Remediation Act in Taiwan since 2000. To our foreign friends, I sincerely hope you will have a wonderful time and an experience to feel the Taiwanese hospitality in next few days.

In 2014 International showcase for soil and groundwater protection,

Taiwan EPA organized many activities including international conference and this exhibition. The objectives of this exhibition are not only to present the successful experience of Taiwan EPA and industrial companies from Taiwan and foreign countries on the survey, assessment, management and remediation of soil and groundwater pollution sites, but also to present the excellent development on the different technologies from Taiwan to reach the world level and try to be as a hub of the Asian and Pacific region. From this exhibition, you also can find some innovative and cost-effective technologies have been developed and applied in the contaminated sites of Taiwan.

In this international exhibition of different equipments and technologies on soil and groundwater, all of you can have a very high impressions on the developing achievements, specific characters and the future development of Taiwan EPA, local environmental protection Bureau, and also local and international industries companies. The major exhibition units include 7 main themes of Taiwan EPA exhibition region, 16 Environmental Protection

Bureau of local governments of Taiwan, 51 local environmental consultant companies and instrument companies and also 10 international companies from Holland, Korea, Japan, AECOM and URS from United States of America.

The Soil and Groundwater Remediation Act of Taiwan allows us not only to establish regulations to protect our soil and groundwater resources but also collect the fees from the importers and manufacturers of the announced potential polluted substances to establish the Soil and Groundwater Pollution Remediation Fund Management Board for conducting investigation and remediation work. Now, we have collected more than 0.1 billion US dollars for the fund to promote more industry companies to develop different survey equipments and technologies to understand the characteristics and hydrogeology of the soil and groundwater contamination sites and also to develop different remediation technologies to clean up the pollutants from the sites.

After your visiting this exhibition, all of you can understand that the Soil And Groundwater Pollution

Remediation Fund Management Board (SAGPRFMB) of Taiwan EPA have made a great contribution to protect the soil and groundwater quality for sustainable and green environmental quality in Taiwan.

countries, to enjoy this international exhibition on soil and groundwater protection in next three days. I also bless your health.

Thank you.

Lastly, I would like to thank all of you, near 700 registered visitors from 17



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Seminar Report –Interesting Sidelights

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Opening Ceremony



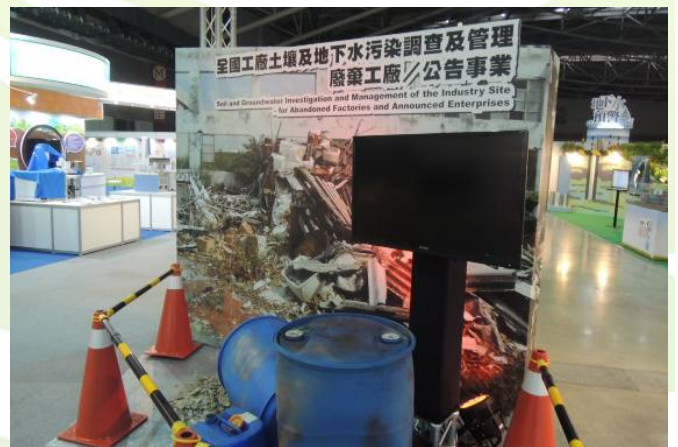
Seminar Report –Interesting Sidelights continued

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Taiwan EPA Exhibition Area



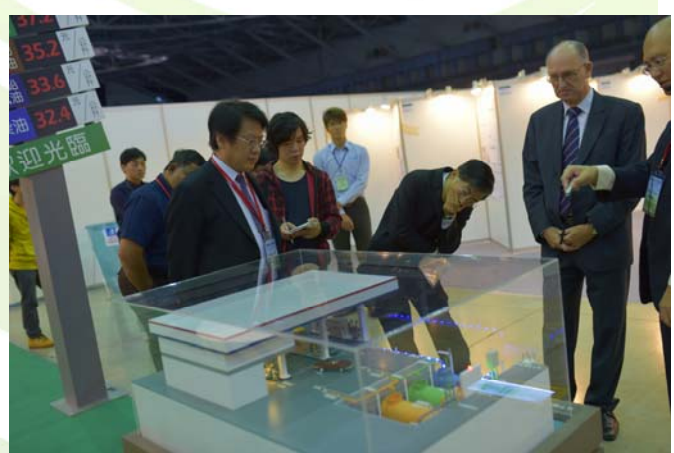
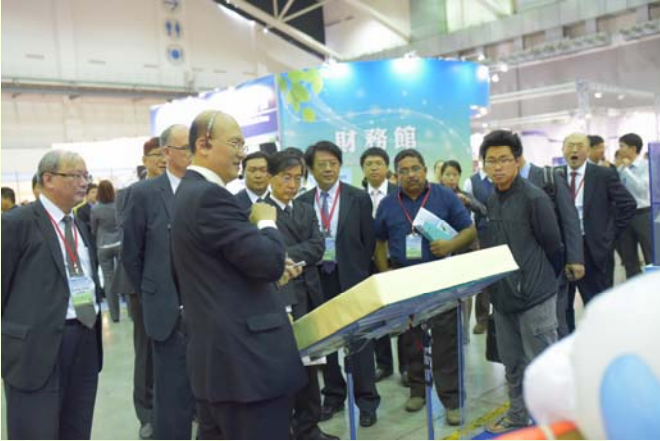
Seminar Report –Interesting Sidelights continued

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Taiwan EPA Exhibition Area

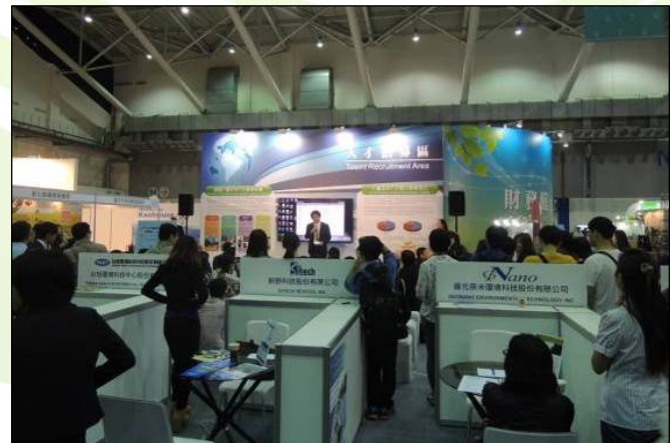
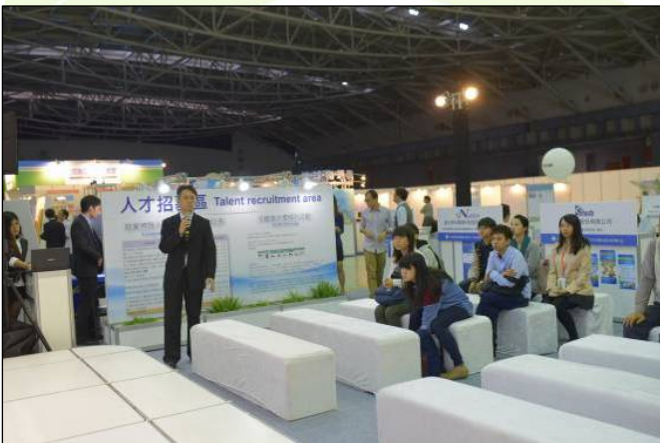


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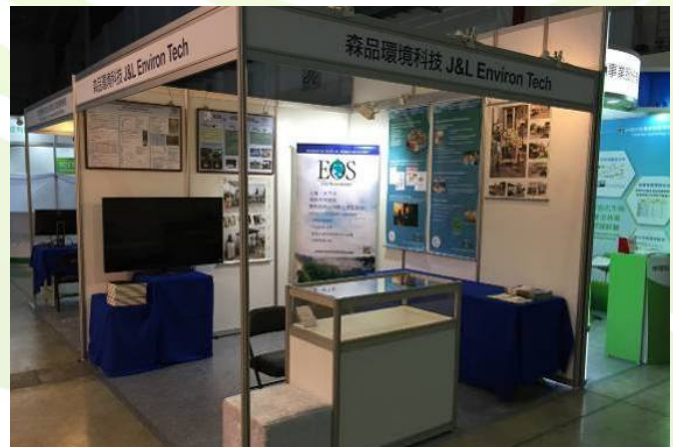
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Company Exhibition Area



Local EPB Exhibition Area



Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan

–Sun Moon Lake, Nantou, Taiwan

Program on November 29, 2014

Time	Schedule
08:00-08:10	<i>Get on the bus at Howard Plaza Hotel or Howard Civil International House</i>
09:10-11:00	Going to Sun Moon Lake, Nantou County
11:00-12:00	<i>Visit Xiangshan Visitor Center, Sun Moon Lake</i>
12:00-13:30	<i>Lunch (Hotel Del Lago)</i>
13:30-16:00	<i>Visit Sun Moon Lake by shuttle boat</i>
16:00-17:30	Sun Moon Lake to Taichung
17:30-18:00	Check in: Hotel National
18:00-19:30	<i>Dinner (Big juicy goose restaurant)</i>
19:30-	<i>Visit Fengjia Night Market (or stay in the hotel)</i>

Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan continued

–Former Cathy Plastic Co. Zhunan Plant, Miaoli, Taiwan

Program on November 30, 2014

Time	Schedule
09:00-09:10	Get on the bus at Hotel National
09:10-10:00	Going to Miaoli
10:00-12:00	Field Study at Former Cathy Plastic Co. Zhunan Plant Site
12:00-13:30	Lunch
13:30-16:00	Going to Tainan
16:00-18:00	Visit Eternal Golden Castle, Anping Harbor, Tainan
18:00-19:30	Dinner (A-Sha restaurant)
19:30-20:30	Going to Kaohsiung
20:30-	Check in: Lees Hotel

Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan continued

–Kaohsiung Multifunctional Commerce and Trade Park, Kaohsiung, Taiwan

Program on December 1, 2014

Time	Schedule
09:00-09:10	<i>Get on the bus at Lees Hotel</i>
09:10-09:30	<i>Going to site</i>
09:30-12:00	<i>Field Study at Kaohsiung Multifunctional Commerce and Trade Park</i>
12:00-13:30	<i>Lunch (85 Sky Tower)</i>
13:30-15:30	<i>Visit Former British Consulate at Dagou</i>
15:30-17:00	<i>Going to Chiayi</i>
17:00-18:00	<i>Dinner</i>
18:00-21:00	Going back to Taipei
21:00-	Check in

Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan continued

November 29, 2014

Sun Moon Lake, Nantou



Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan continued

November 30, 2014

Former Cathy Plastic Co. Zhunan Plant Site, Miaoli



Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan continued

November 30, 2014

Former Cathy Plastic Co. Zhunan Plant Site, Miaoli



Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan continued

December 1, 2014

Kaohsiung Multifunctional Commerce and Trade Park



Study Tour to Soil and Groundwater Contaminated Sites in Western Taiwan continued

December 1, 2014

Kaohsiung Multifunctional Commerce and Trade Park



Program of Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE

Date: **November 24, 2014**

Venue: **Meeting Room CR406, Howard Plaza Hotel Taipei, Taipei, Taiwan**

Time	Topics
1530-1540	Welcome address (Taiwan)
1540-1545	Introduction of delegates
1545-1555	Opening address (Korea)
1555-1620	1 st Item: To promote the exchange information on the "Soil and Groundwater Pollution and Remediation Act"
1620-1645	2 nd Item: To arrange the visiting and study programs of the soil and groundwater pollution sites
1645-1700	Coffee Break
1700-1725	3 rd Item: To initiate some international cooperative remediation project for the contamination site located at other foreign countries
1725-1750	4 th Item: To set the website and fixed contact person to promote more activities and share the information and experience.
1750-1800	Group photo

Minutes of Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE

Date: 15:30 - 18:00, November 24, 2014

Venue: Meeting Room 406, Howard Plaza Hotel Taipei, Taipei, Taiwan

Present:

(Taiwan) Hung-Teh Tsai (Executive Secretary, SAGPR/FMB, Environmental Protection Administration)

Kai-Hsing Yang (Chief, SAGPR/FMB, Environmental Protection Administration)

Hao-Chun Hung (Senior Environmental Technology Specialist, SAGPR/FMB, EPA)

Zueng-Sang Chen (Professor, National Taiwan University)

Dar-Yuan Lee (Professor, National Taiwan University)

Jimmy Kao (Professor, National Sun Yat-Sen University)

(Korea) Hoe-Seog Cheong (Direct General, Water Environment Policy Bureau, Ministry of Environment)

Jung-Ju Kim (Executive Director, KEITI, Environmental Technology Department)

Sei-Dal Bae (Executive president, H-Plus Eco Ltd.)

Jae-Eui Yang (Professor, Kangwon National University)

Kang-Keun Lee (Professor, Seoul National University)

Jai-Young Lee (President, Korean Society of Soil & Groundwater Environment)

In Attendance :

(Taiwan) Chih Huang (Principal Consultant, ERM Taiwan Co., Ltd.)

Tsair-Fuh Lin (Professor, National Cheng Kung University)

Chih-Jen Lu (Professor, National Chung Hsing University)

Colin S. Chen (Professor, National Kaohsiung Normal University)

Shih-Cheng Pan (President, Sinotech Environmental Technology Ltd.)

Spock Huang (Regional Director of Greater China, MWH Taiwan Branch, Americas Inc)

Yen-Min Lin (Vice General Manager, Taiwan Environment Scientific Co., Ltd. (TESC))

Chen-Rong Chian (Chairman, Taiwan-Asahi Environmental Technology Co., Ltd.)

Wei-Chou Lin (Technical Manager, Sinotech Engineering Consultants, Ltd.)

(Korea) Jung-Chul Park (Deputy Director, Ministry of Environment)

Yae-Jin Park (Editor, Soil & Ground Water Division, Ministry of Environment)

Myung-Hyun Cho (Director, KEITI, Environmental Technology Department)

Minah Kim (General Manager, KEITI, Environmental Technology Department)

Kyu-Tak Cho (Project Manager, KEITI, Environmental Technology Department)

Junghak Ki (Researcher, KEITI, Environmental Technology Department)

Tae-Seung Kim (Director, NIER, Soil and Groundwater Research Division)

Minutes of Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE continued

(Korea) Joung-Ku Park (General Director, Korea Environment Corporation, Department of Soil & groundwater)

Byung-Cheal Moon (Principal Consultant, ERM Korea)

Geon-Ha Kim (Professor, Hannam University)

Jang-Hi Han (Director, Dong Myung Enterprise. Co., Ltd.)



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Minutes of Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE continued

Welcome Address at 15:30 - 15:45

1. Mr. Hung-Teh Tsai, who is the executive secretary of Soil and Groundwater Remediation Fund Management Board of Taiwan EPA, delivered an welcome address and welcomed all invited participants.



Mr. Hung-Teh Tsai (蔡鴻德)

Executive Secretary

Soil and Groundwater Remediation Fund Management Board

Environmental Protection Administration, Taiwan

2. Mr. Hung-Teh Tsai introduced the participants from Taiwan, including the Steering Committee members of MOU and other delegation members.

Opening Address at 15:45 - 15:55

3. Dr. Hoe-Seog Cheong, who is the Director General of Water Environment Policy Bureau of Korea MOE, delivered an opening address and introduced the participants from Korea.



Dr. Hoe-Seog Cheong

Director General

Water Environment Policy Bureau

Ministry of Environment, Korea



Minutes of Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE continued

Business Meeting at 15:55 - 16:45

Discussion Item 1: To promote the exchange information on the “Soil and Groundwater Pollution and Remediation Act”

4. Taiwan and the ROK agreed to promote the exchange information on the “Soil and Groundwater Pollution and Remediation Act”. Each party shall translate soil and groundwater related Acts to Chinese or Korean in the next six months in order to discuss and learn from each other.
5. Acts, policies and management systems regarding soil and groundwater will also be discussed in future steering meetings.
6. Each party assign one delegation member as the person in charge of the abovementioned information exchange.

Discussion Item 2: To arrange the visiting and study programs of the soil and groundwater pollution sites

7. Taiwan and the ROK agreed on arranging visits and study programs of the soil and groundwater pollution sites. Each party shall provide a list of pollution sites to be visited and studied.
8. Taiwan will provide sites in industrial parks and abandoned mine lands while the ROK will provide sites in the farmland and abandoned mine lands. The numbers of sites shall be further discussed.



Ms. Jung-Ju Kim
Executive General
Korea Environmental Industry &
Technology Institute (KEITI)



Mr. Kai-Hsing Yang
Chief
Soil and Groundwater Remediation
Fund Management Board, Taiwan EPA



Prof. Zueng-Sang Chen
Professor
National Taiwan University

Minutes of Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE continued

Business Meeting at 17:00 - 17:50

Discussion Item 3: To initiate some international cooperative remediation project for the contamination site located at other foreign countries

9. The ongoing cooperation project funded by the ROK will be completed by the end of September, 2015 and the cooperation project funded by Taiwan will be started in January, 2015.
10. Taiwan and the ROK discussed the possibility of developing cooperation projects in other member countries of the ReSAGPAPR working group. This topic will be discussed in the next meeting.

Discussion Item 4: To set the website and fixed contact person to promote more activities and share the information and experience

11. Taiwan and the ROK agreed on setting up a website and a fixed contact person to promote more activities and the sharing of information and experience.



Ms. Myung-Hyun Cho
Director General
Korea Environmental
Industry & Technology
Institute (KEITI)



Prof. Tsair-Fuh Lin
Professor
National Cheng
Kung University



Interesting Sidelights at Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE



Interesting Sidelights at Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE continued



Interesting Sidelights at Steering Committee Meeting of MOU between Taiwan EPA and Korea MOE continued

Welcome Dinner Party at Hung Kan restaurant (紅堪港式茶飲) on November 24, 2014



Program of Taiwan-Korea Forum on Remediation of Soil and Groundwater

Date: November 27, 2014

Venue: Conference Room 503, Taipei World Trade Center Nangang Exhibition Hall, Taiwan

Time	Topics	Speaker
09:00-09:30	Opening Ceremony	
09:30-10:00	Cases study of the application of ERT method to the soil and groundwater contaminated sites	Tzu Pin Wang (Geophysical Technology & Engineering Co. Ltd., Consultant)
10:00-10:30	Development of a Framework to Support Administrative Decisions on the Reuse of Remediated Sites	Geonha Kim (Hannam University, Professor)
10:40-11:10	Coffee Break	
11:10-11:40	Pollution Prevention and Management on Soil and Groundwater Contamination for Gas Stations	Chih-Tse Wang (MWH, Taiwan)
11:40-12:10	Oil Leakage Monitoring Facilities for Soil and Groundwater Pollution Prevention	Janghi Han (Dong Myung Enterprise. Co. Ltd., Director)
12:10-13:30	Lunch	
13:00-14:00	Troubleshooting and Investigation of Soil and Groundwater project in Operating Factories with Chlorinated Organic Compounds	Hsiu-Chuan Kuo (Apollo Technoloy Co. Ltd., Project manager)
14:00-14:30	Management for Semi-Volatile Organic Soil Pollutants in South Korea	Tae-Seung Kim (NIER, Director)
14:30-15:00	Environmental characteristics and risk management of high Cr and Ni background levels in serpentinitic areas in Taiwan	Yun-Jie Lai (Apollo Technoloy Co. Ltd., Project manager)
15:00-16:00	Coffee Break & Poster Discussion	
16:00-16:30	Introduction of KECO Business and Korea-Taiwan Scheme of Cooperation	JoungKu Park (Korea Environment Corporation, General Director)
16:30-17:00	Closing Remarks and Ceremony	

Seminar Report –Interesting Sidelights

Taiwan-Korea Forum on Remediation of Soil and Groundwater

November 27, 2014

Conference Room 503, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



Opening Remarks

Mr. Hung-Teh Tsai
Environmental Protection Administration
Taiwan



Opening Remarks

Ms. Jung-Ju Kim
KEITI (Korea Environmental Industry
& Technology Institute)

Seminar Report –Interesting Sidelights continued

Taiwan-Korea Forum on Remediation of Soil and Groundwater

November 27, 2014

Conference Room 503, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



Invited Speaker
Tzu-Pin Wang
Taiwan



Invited Speaker
Geonha Kim
Korea



Invited Speaker
Chih-Tse Wang
Taiwan



Invited Speaker
Janghi Han
Korea

Seminar Report –Interesting Sidelights continued

Taiwan-Korea Forum on Remediation of Soil and Groundwater

November 27, 2014

Conference Room 503, Taipei World Trade Center Nangang Exhibition Hall, Taipei, Taiwan



Study Tour to Soil and Groundwater Contaminated Sites in Northern Taiwan

–Former RCA Taoyuan Plant, Taoyuan, Taiwan

Program on November 28, 2014

Time	Schedule
09:30-09:40	Get on the bus at Howard Plaza Hotel Taipei
09:40-10:30	Going to Former RCA Taoyuan Plant Site
10:30-12:00	<i>Field Study at Former RCA Taoyuan Plant Site</i>
12:00-12:30	Going to restaurant
12:30-14:00	<i>Lunch</i>
14:00-14:30	Going to Neiwan, Hsinchu
14:30-17:30	<i>Visit Neiwan Old Street</i>
17:30-19:00	<i>Dinner (Neiwan Theater)</i>
19:00-	Going back to Taipei

Study Tour to Soil and Groundwater Contaminated Sites in Northern Taiwan continued

November 28, 2014

Former RCA Taoyuan Plant Site



Study Tour to Soil and Groundwater Contaminated Sites in Northern Taiwan continued

November 28, 2014

Former RCA Taoyuan Plant Site

