台日學術交流研討會

(北九州市立大學)

服務機關：台北科技大學環境工程與管理研究所

姓名職稱：王立邦 助理教授

派赴國家：日本

出國期間：106 年 3 月 26 日至 106 年 4 月 1 日

報告日期：106 年 4 月 13 日

摘要

台北科技大學環境工程與管理研究所師生 11 名，於 106 年 3 月 26 日至 4 月 1 日，前往日本北九州市立大學(日本福岡縣北九州市)進行學術交流活動。參與的學生於本次學術交流研討會中，皆以英文發表報告各自於平日所進行研究的成果，聽取台日四系所與會人員對其研究內容的評論與建議，培養於國際學術研討會報告時所應具備的能力，並體驗台日兩國的文化差異。此外，四所大學各派出一位教授進行專題講座，對其研究專長與領域更深一步的分享、講解。本次的台日學術交流活動，參與學生皆獲得許多寶貴的經驗，對於其未來的學術研究及生涯發展，具有正面的影響及啟發。

目次

目的

計畫目標：

為促進台北科技大學環境工程與管理研究所(以下簡稱本所)與台灣中原大學環境工程學系、日本北九州市立大學国際環境工学部和日本熊本縣立大學環境共生学部環境資源学科等四校系所間的國際交流，培養本所學生的國際研討會發表報告能力，並拓展其國際視野，培養國際觀，特辦理本次台日學術交流研討會。

主題：

本次台日學術交流研討會係由日本北九州市立大學国際環境工学部籌備辦理，本所師生赴日本參加的方式進行。由台日四校系所的碩博士班學生，交互以英文報告各自於環境工程與管理相關領域的研究成果，包括水處理、廢棄物處理、空氣污染控制、毒性物質處理、環境管理等，以進行四校系所間學術研究成果交流。

緣起：

本所張添晉教授與日本熊本縣立大學環境共生学部環境資源学科篠原亮太教授，為促進台日兩校系所間的國際交流合作，拓展兩校系所學生的國際視野，所發起的兩校系所間台日學術交流活動，迄今已超過十年以上的歷史。於 103 年起日本北九州市立大學国際環境工学部與中原大學環境工程學系亦加入，成為四校系所間之台日學術交流活動。本活動主要係以國際學術交流研討會的方式，由台日四校系所輪流籌備主辦，或由本所主辦，日方師生前來台灣參加，或由日方

主辦，本所師生赴日本參加。本活動前次係於去年九月下旬由中原大學環境工程學系辦理，本次係由日方辦理，我方師生赴日參加。

預期效益或欲達成事項：

持續促進台日四校系所間國際交流合作，並培養本所碩博士學生的國際研討會發表報告能力。參與學生以英文發表報告各自於平日所進行研究的成果，聽取台日兩系所與會人員對其研究內容的評論與建議。此外亦體驗台日兩國的文化差異，拓展其國際視野，培養國際觀，對於其未來的學術研究及生涯發展，將有正面的影響及啟發。

過程

出國人員：

老師：曾昭衡教授、王立邦助理教授

學生：楊欣諺、陳柏翰、葉輔根、廖婷雩、洪碧伶、楊桂慈、邱彥禎、楊仕丞、張漪(以上皆為本所碩士生)共計十一名

出國期間行程：

時間	行程	地點
3/26 (日)	赴日	台北->福岡
3/27 (一)	福岡市內參觀	福岡
3/28 (二)	福岡能古島	福岡
3/29 (三)	移動、研討會報告準備	福岡->北九州市
3/30(四)	台日交流研討會	北九州市
3/31(五)	新門司焚化廠參觀、門司港參觀	北九州市
4/1(六)	返台	福岡->台北

進行過程：

本次台日學術交流研討會的議程如表一所示。106 年 3 月 30 日(三)上午 09:00 起於北九州市立大學国際環境工学部的會議室舉行。首先由北九州市立大學吉塚教授、本所曾昭衡教授、中原大學游勝傑教授、熊本縣立大學石橋康弘教授分別進行開幕致詞。隨後台日雙方進行紀念品交換，所有參加本次學術交流研討會的台日師生進行合照後，即進入研討會的發表報告。

本次學術交流研討會自上午 9:20 起至下午 17:00 為止，上午場為四校教授的專題講座，分享各自研究領域與研究內容；下午場為四校學生的學術交流，共分為三間教室，一間教室各有三個場次進行。每場次皆由四位四校系所學生交互上台進行各自的研究成果報告，包括水處理、廢棄物處理、空氣污染控制、環境化學、環境管理等環境工程與管理相關領域，每位學生報告時間約 10 分鐘，問答 4 分鐘，合計約 14 分鐘。每場次的主持人亦由四校系所學生輪流擔任。主持人的主要工作任務為掌握全場，控制時間，使各場次的每個報告皆能如期順利進行。本所係由邱彥禎、楊仕丞、洪碧伶、陳柏翰等四位同學輪流擔任主持人。本次研討會台日四校系所學生合計 36 人進行報告，全程皆以英文報告發表及提問討論。

研討會最後由北九州市立大學吉塚教授做閉幕致詞總結。

圖 1 本次研討會全體與會者合影

圖 2 本所學生於北九州大學校園合影

表一、本次台日學術交流研討會議程

2017 Japan - Taiwan International Symposium on Environmental Science, Technology and Management

Date	March 30 – 31, 2017
Honorable Guests	**・The University of Kitakyushu** Prof.Kazuharu YOSHIZUKA, Prof.Takaaki Kato, Prof.Syouhei NISHIHAMA, Arisa USUI, Narito ENTA, Takuma SEKIMOTO, Jeongyi MOON, Emi YAMADA, Minh Tuan PHAM, Anh Viet HOANG, Atsushi KURAOKA, Shinji TAWARA, Yuma FUCHINO **・Prefectural University of Kumamoto** Prof. Yasuhiro ISHIBASHI, Prof. Jun KOBAYASHI, Prof. Tetsuro AGUSA, Chia-Yu WU, Chang-Hua HE, Masaru NAKAMURA, Erina MATSUYAMA, Kohei YOSHIKAWA, Kento ARAKI, Yuta IMAMURA, Ryosuke NAKAMURA, Emi MOROKUMA, Satomi TAJIRI, Kuang-Wei HUANG, Yuka YAKUSHIJI **・National Taipei University of Technology** Prof. Chao-Heng TSENG, Prof. Li-Pang WANG, Ting-Yu LIAO, Bi-Ling HONG, Kuei-Tzu YANG, Yi ZHANG, Bo-Han CHEN, Shih-Cheng YANG, Sin-Yan YANG, Yen-Chen CHIU, Fu-Ken YEN **・Chung Yuan Christian University** Prof. Sheng-Jie YOU, Prof. Ya-Fen WANG, Prof. Yu-Dong FU, Prof. Jheng-Jie JIANG, Prof. Wu-Yang SEAN Yi-Hsien LIU, Yu-Ching DENG, Yun-Hsiang HOU, Fang-Tzu CHANG, Hui-Chi CHUANG, Min-Hsuan CHEN, Chin-Chieh HO, Lun DU, Tzu-Hao YEH, Chin-Ya CHANG Gen-Mu CHANG, Hsiao-Yi LIN, Pei-Yin HSIEH

Schedule	**March 30** 2017 Japan - Taiwan International Symposium on Environmental Science, Technology and Management **March 31** Excursion for Shin-Moji incineration plant

Program

Opening Ceremony (Room N107)		
Time	**Speakers**	**Topic**
9:00 – 9:20	Prof. Kazuharu YOSHIZUKA Prof. Yasuhiro ISHIBASHI Prof. Chao-Heng TSENG Prof. Sheng-Jie YOU	Opening Remarks and Photo
9:20-12:00	**Special Lecture / Chair : Prof. YOSHIZUKA, Prof. YOU**	
9:20 – 9:55	Professor Takaaki KATO	Maximum Electricity Saving Behavior in a Dynamic Pricing Experiment
9:55 – 10:30	Professor Chao-Heng TSENG	The $PM_{2.5}$ Standard, Index, and Warning Scheme in Taiwan
10:30 – 10:50	**Coffee Break**	
10:50 – 11:25	Professor Tetsuro AGUSA	Arsenic Pollution in Southeast Asia
11:25 – 12:00	Professor Yu-Dong FU	Conservative Heavy Metals Total Discharge Schemes
12:00 – 13:30	**Lunch**	
13:30 – 17:00	**3 sessions in parallel at N107, N113, and N115**	
17:00 – 17:10	**Closing Remark**	
18:00 – 20:00	**Gathering Party**	

ROOM N107

13:30 – 14:30	**Section 1-1 / Moderator: Narito ENTA, Yu-Ching DENG**	
13:30 – 13:45	Chin-Chieh HO	The Application of Lanthanum-Doped Titanium Dioxide Photocatalytic Coating on Porous Air Filter in Gas Degradation
13:45 – 14:00	Takuma SEKIMOTO	Selective Extraction of Lithium from Salt Lake Brine with Mixture of Tributyl Phosphate and Ionic Liquid
14:00 – 14:15	Sin-Yan YANG	A Study on Characteristic of Street Dust Associated with Ambient $PM_{2.5}$
14:15 – 14:30	Masaru NAKAMURA	Purifying and Analyzing Oligosaccharide into Molasses of Palm Oil Residual
14:30 – 14:45	**Coffee Break**	
14:45 – 15:45	**Section 1-2 / Moderator: Kohei YOSHIKAWA, Yen-Chen CHIU**	
14:45 – 15:00	Hui-Chi CHUANG	Bi Modified Bi_2MoO_6 Microspheres by Photo-Reduction with Enhanced Visible Light Photocatalytic Activity for Degradation of NOx
15:00 – 15:15	Narito ENTA	Removal of Boron from Geothermal Water of Balçova (Turkey) with Glucamine-Based Chelate Adsorbents
15:15 – 15:30	Chia-Yu WU	Removal of Mercury in Various Matrices Using Forward Osmosis Process
15:30 – 15:45	Yu-Ching DENG	Removal of Chromate in Groundwater by Layer Double Hydroxides
15:45 – 16:00	**Coffee Break**	
16:00 – 17:00	**Section 1-3 / Moderator: Takuma SEKIMOTO, Chin-Chieh HO**	
16:00 – 16:15	Kohei YOSHIKAWA	The Treatment of Methane Fermentation by Activated Sludge of Humus
16:15 – 16:30	Yen-Chen CHIU	Transformation of Phosphorus in Sewage Sludge by the Addition of Calcium Hydroxide
16:30 – 16:45	Fang-Tzu CHANG	High Temperature Related Spatial Vulnerability Assessment for Population with Diseases
16:45 – 17:00	Kuang-Wei HUANG	Flow and Management of Mercury-Contained Material in Coal-Fired Power Plants in Indonesia

ROOM N113

13:30 – 14:30	**Section 2-1 / Moderator: Emi YAMADA, Shih-Cheng YANG**	
13:30 – 13:45	Bi-Ling HONG	The Study of Dust Emission Rate of Zhuoshui River by Regression Analysis
13:45 – 14:00	Chin-Ya CHANG	Optimized Analysis and the Cost-Benefit Analysisfor Urban Pavement Reconstruction
14:00 – 14:15	Erina MATSUYAMA	Analysis of Food Chain Accumulation for Perfluoroalkyl Acids (PFAAs) by Using Stable Nitrogen Isotope Ratio of Amino Acids in Tokyo Bay
14:15 – 14:30	Kuei-Tzu YANG	Carbon Footprint Assessment of Multimedia Online Services-A Case of Taiwan Mobile Co., Ltd.
14:30 – 14:45	**Coffee Break**	
14:45 – 15:45	**Section 2-2 / Moderator: Ryosuke NAKAMURA, Yi-Hsien LIU**	
14:45 – 15:00	Fu-Ken YEN	A Study of Gender Difference in Cost-benefit of Air Pollution Reduction
15:00 – 15:15	Hsiao-Yi LIN	The Effect of Flood Potential on Residential Property Value: A Case of Hedonic Price Analysis in Taipei City
15:15 – 15:30	Chang-Hua HE	Mercury Elution Characteristics and Influence of Soil from a Dumping Sites Vicinity
15:30 – 15:45	Shih-Cheng YANG	Material Flow Analysis of Neodymium in Taiwan
15:45 – 16:00	**Coffee Break**	
16:00 – 17:00	**Section 2-3 / Moderator: Erina MATSUYAMA, Bi-Ling HONG**	
16:00 – 16:15	Emi YAMADA	Separation and Recovery of Nd and Pr from Waste Nd Magnet Using Coated Solvent Impregnated Resin
16:15 – 16:30	Yi-Hsien LIU	Recovery of Neodymium from Waste Permanent Magnet by Support Liquid Membrane System and Develop High Quality Photocatalyst
16:30 – 16:45	Ryosuke NAKAMURA	Metabolism Rate of Decabrominated Diphenyl Ethers by Hepatic Microsome of Fish
16:45 – 17:00	Pei-Yin HSIEH	Numerical Study on Replacement of Methane Hydrates by CO_2 in Pore-scale Flow

ROOM N115

13:30 – 14:30	**Section 3-1 / Moderator: Kento ARAKI, Yun-Hsiang HOU**	
13:30 – 13:45	Emi MOROKUMA	Species Specificity of Protein Binding with Perfluorinated Chemicals (PFCs)
13:45 – 14:00	Anh Viet HOANG	Removal of Arsenic from Aquatic Environment by Adsorption Method
14:00 – 14:15	Ting-Yu LIAO	Practice and Action of Enterprises in Response to Circular Economy - Experiences of International Sustainable Enterprises
14:15 – 14:30	Lun DU	Simultaneous Estimation of Internal Resistance and Open-Circuit Voltage of Lithium-Ion Batteries with Temperature Compensation
14:30 – 14:45	**Coffee Break**	
14:45 – 15:45	**Section 3-2 / Moderator: Yuta IMAMURA, Bo-Han CHEN**	
14:45 – 15:00	Kento ARAKI	Thermophilic Bacterium Promote Solubilization of Methane Fermentation Process Isolate and Functional Analysis
15:00 – 15:15	Yun-Hsiang HOU	Prepare Gas Separation Membrane of PDMS/PSF Membrane to Separation SVE Emissions Gas
15:15 – 15:30	Yi ZHANG	Management and Cost Analysis of Desalination Plant
15:30 – 15:45	Tzu-Hao YEH	Study on Inhibitory Effect of Water Development Nanoscale Composite Material Used in Polyaniline
15:45 – 16:00	**Coffee Break**	
16:00 – 17:00	**Section 3-3 / Moderator: Anh Viet HOANG, Lun DU**	
16:00 – 16:15	Min-Hsuan CHEN	Prepare and Synthesis g-C_3N_4/$Bi_2O_2CO_3$ Layered Heterojunction Photocatalyst for Pollutant Degradation
16:15 – 16:30	Yuta IMAMURA	Study on the Equines Estrogenic Pollution in Water Environment
16:30 – 16:45	Bo-Han CHEN	A Study of Circular Economy and Development Urban Mine in Asia
16:45 – 17:00	Gen-Mu CHANG	Effect of Climate Change on Water Quality of Taiwan Rivers

心得及建議

(一) 參與本次台日學術交流研討會的本所碩士班學生，皆於研討會中報告各自於平日所進行研究的成果，聽取台日兩系所與會人員對其研究內容的評論與建議，期間皆全程以英文發表報告及提問討論，充分達到學術交流的目的。此外，參與本次交流的碩士生，幾乎都是第一次出國。從搭機出國至返抵國門為止，都是人生第一次的體驗。本次的學術交流活動，對於拓展其國際視野及建立國際觀，增長見識，皆有實質的助益。

(二)本次學術交流，第二天為參觀新門司焚化廠，參觀完畢後前往門司港觀光，但事前我方師生並未得知要去門司港此事，導致我方接下來的行程變得相當緊促。希望下次的學術交流，主辦方可以公布時程並雙方透過良好的溝通，以便安排各自的行程。

(三)本所十餘年來積極推動與國外大學間的學術交流，不遺餘力，成果豐碩。惟所需經費無論本所師生赴國外大學進行交流時所需的機票等旅費，或是國外大學至本所進行交流時本所的各項事務支出，皆由本所自行籌措。經費來源主要為本所行政管理費，以及所上老師的產學合作計畫等計畫經費中捻出，以維持台日兩校系所持續十餘年來的交流不致中斷甚至中止，實屬不易。盼校方日後對於類似有意義的國際交流活動，在經費與行政作業上能給予協助與支持。

附件: Profile & Abstract

Profile

Name:	曾昭衡 Chao-Heng Tseng	
Birthdate (Age):	Aug 8, 1970	
Hobby:	Movie	
Affiliation:	Indoor Environmental Quality Research Center (IEQ-RC); Institute of Environmental Engineering and Management, National Taipei University of Technology	
Title:	Professor	
E-mail:	tsengco@ntut.edu.tw	
Homepage:	http://www.ntut.edu.tw/~tsengco	

Research Projects & Budgets

1. "The Environmental and Health Co-benefit and Gender Impact Assessment of Criteria and Hazardous Air Pollution Reduction", Ministry of Science and Technology (MOST) (2015-2018)

2. "The System Dynamics Evaluation of the Environmental and Health Effects of Mercury Exposure and Reduction in Taiwan", Ministry of Science and Technology (MOST) (2011-2014)

Profile

Name:	Li-Pang WANG	
Birthdate (Age):	May 6, 1973 (44)	
Hobby:	Reading, Baseball, Travel	
Affiliation:	Institute of Environmental Engineering and Management National Taipei University of Technology	
Title:	Assistant Professor	
E-mail:	kuniwang@ntut.edu.tw	
Homepage:	http://www.ieem.ntut.edu.tw/bin/home.php	

Research Projects & Budgets

1. Recovery of rare earth metals from ceria-based glass polishing waste (Ministry of Science and Technology (MOST), 2015-2016)

2. Recovery of phosphorous from sewage sludge based on the concept of mineral processing (Ministry of Science and Technology (MOST), 2016-2017)

Profile

Name:	Yen , fu-ken	
Birthdate (Age):	September 14, 1993 (23)	
Hobby:	Listen music & sports	
Affiliation:	Institute of Environmental Engineering and Management National Taipei University of Technology	
E-mail:	qwer09142003@hotmail.com	
Homepage:	https://www.facebook.com/fugen.ye	

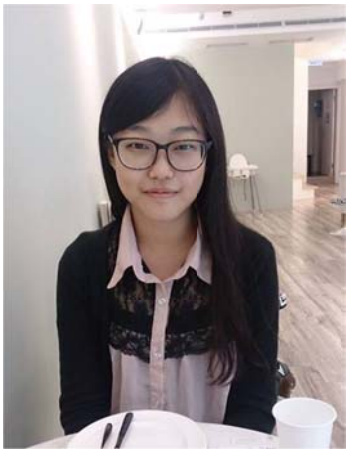
Research Theme

A Study of Gender Difference in Cost-benefit of Air Pollution Reduction

Brief of Research Theme

This study assessed the gender difference of on the health effects of criteria air pollutants particulates (PM10, PM2.5), sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO) and ozone (O3). Air Resource Co-Benefit Model (ArCoBModel) was used to conduct a cost benefit analysis on the air pollution reduction policy. In addition, the results were drawn as maps, include air pollution reduction maps, health benefits maps, and premature death maps, which could provide a reference for government to make the policy.

Profile

Name:	Bi-Ling Hong	
Birthdate (Age):	September 28, 1993 (23)	
Hobby:	Listening music	
Affiliation:	Institute of Environmental Engineering and Management National Taipei University of Technology, Taipei City, Taiwan.	
E-mail:	d0148007@gmail.com	
Homepage:	https://www.facebook.com/HongBiLing	

Research Theme

The Study of Dust Emission Rate of Zhuoshui River by Regression Analysis

Brief of Research Theme

In Yunlin, dust emissions from the bare land near Jhuoshuei River is important environmental issues. Thus, the main purpose of this study was building the formula of dust emission and simulate the dust dispersion to find the influence areas.

The relationship between dust concentration and meteorological factors was used to set up the dust emission formula of Zhuoshui River. Finally, this study tried to use the AERMOD modeling system to simulate the Aeolian dust from riverbed, besides, the meteorological situation of Zhuoshui River was simulated by Weather Research and Forecasting (WRF) model. The results indicated that PM_{10} concentration would increase when the relative humidity decreased and the temperature increased. According to the statistical results, the dust emission was following $Q = (48.61 \times WS + 2.39 \times Temp - 0.76 \times RH - 190.32) \times u \times 10^{-7}$ formula, the simulation results of dust transport demonstrated that the average error was less than 50% and better than Taiwan Emission Data System8.1.

Profile

Name:	Bo-Han Chen
Birthday (Age):	June 14, 1994 (23)
Hobby:	Mountain Climbing
Affiliation:	Ms student of Environmental Planning and Management. Taipei University of Technology.
E-mail:	cv15897@gmail.com
Homepage:	https://www.facebook.com/bohan.chen.100

Research Theme

A study of research about the Circular Economy and development urban mine in Asia.

Brief of Research Theme

In recent years, technology developed rapidly. It caused many international problems such as climate change, population growth and the consumption of materials. At the same time, to solve the problem of waste and to use the materials more efficient. We start to develop circular economy, to keep the materials can be use sustainably.

First step is to research the urban mine in Taiwan and other countries, including electro and electronic equipment. Second, research the waste treatment and recycling process to find the best way to keep the materials sustainably. Third step is to survey the quantity and purity of recycling materials. If the recycling materials have high quantity and purity, then we can consider it is very good about keeping materials sustainable.

Profile

Name:	Yang, Kueitzu	
Birthdate (Age):	October 3, 1992 (24)	
Hobby:	Guitar	
Affiliation:	Institute of Environmental Engineering and Management National Taipei University of Technology	
E-mail:	m3492837@hotmail.com	
Homepage:	https://www.facebook.com/Kueitzu1003	

Research Theme

Carbon Footprint Assessment of Multimedia Online Services-A Case of Taiwan Mobile Co., Ltd.

Brief of Research Theme

Due to the rapid and continuous development of smartphones and mobile network, cloud computing has gained rapid application in recent years but it is also accompanied by the amazing energy use. There are a lot of environment impact or carbon footprint study, which is about e-books, online video rental, games and other cloud services, but there are still rarely investigated in Taiwan. In light of the facts mentioned above, this study intends to explore carbon footprint of multimedia online services by Taiwan Mobile's myMusic, myVedio and myBook. Through differents scenarios to find out the carbon footprint for differences caused by the network transmission types when consumer use 3G mobile network or 4G mobile network.

Profile

Name:	Yang,Shih-Cheng	
Birthdate (Age):	December 2, 1993 (24)	
Hobby:	baseball	
Affiliation:	Institute of Environmental Engineering and Management National Taipei University of Technology	
E-mail:	s890952001@gmail.com	
Homepage:	https://www.facebook.com/profile.php?id=100003925767365	

Research Theme

The investigation of Taiwan Neodymium material flow

Brief of Research Theme

Recently, issues related to rare earth are discussed more frequently, which are mostly applied on industries such as innovative and green technology.They are also critical raw materials for prioritized development of electrics, machinery and electronics industries in Taiwan, and also have a reputation as “Industrial Vitamin in 21st Century”.

Electrical and optical industries are critical and key industries in Taiwan and the materials such as Neodymium (Nd) is significant for these industries. That operation cost is extremely sensitive to price fluctuation of rare earth due to China government set up quota for exporting of rare earth. Taiwan is an island state

Profile

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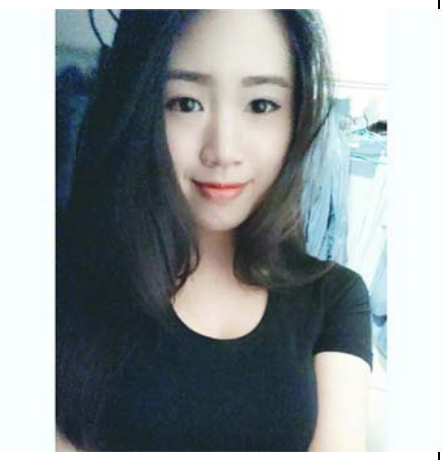
Research Theme

A study on characteristic of street dust associated with ambient $PM_{2.5}$

Brief of Research Theme

The dissertation presents the characteristic of street dust in Taiwan, collecting twenty two country's street dust samples in Taiwan, and selecting 50 roads.The sample collection method for the street dust according to U. S. EPA AP-42 procedures, which are based on a review of American Society for Testing and Materials (ASTM) methods C-136. This study purpose to find the concentration of fine suspended particles caused by street dust in paved toad and study silt characteristics of the metropolitan area of the road in order to learn the extent of the effects of air concentrations of fine suspended particles.

Profile

Name:	Ting-Yu, Liao (Lily Liao)	
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Research Theme

Practice and Action of Enterprises in response to Circular Economy - Experiences of International Sustainable Enterprises

Brief of Research Theme

A circular economy is restorative and regenerative by design, and aims to keep products, components, and materials at their highest applied and value at all times. There are six practices can achieve to the circular economy, reDesign, Circular Processing, Circular Agriculture, Closing the Loop, Collaboration /Symbiosis /Sharing, and Innovative Business Model respectively, built by Ellen MacArthur Foundation. Through the case studies, we collected many practices by the international sustainable enterprises, for example, Philips sell the “Light Service” instead of selling light bulbs to find out what’s the suitable practices and actions to achieve the circular economy in Taiwan.

Profile

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Research Theme

Transformation of phosphorus in sewage sludge by the addition of calcium hydroxide

Brief of Research Theme

Sewage sludge (SS) is the by-product of wastewater treatment. Phosphorus (P) in SS can be divided into five types, including total phosphorus (TP), inorganic phosphorus (IP), organic phosphorus (OP), non-apatite phosphorus (NAIP) and apatite phosphorus (AP). However, only AP has a high bioavailability and a wide range of industrial application. In order to improve the recycling of P is SS, it is necessary to transfer different types of P to AP. This study attempted to achieve this objective by the addition of calcium hydroxide ($Ca(OH)_2$). The effects of $Ca(OH)_2$ dosage, reaction temperature, and reaction time on the transformation of P to AP were investigated.

Profile

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Research Theme

Forward osmosis efficiency analysis used in seawater desalination

Brief of Research Theme

Study on forward osmosis technology at present, with the forward osmosis desalination technology economic benefit and the effect on the environment, combined with the environmental impact assessment and simulation environment by using computer, reduce energy loss and reduce the loss of water. In addition, previous studies on desalination costs, the forward osmosis and reverse osmosis were compared, in order to prove the benefits of forward osmosis.

The $PM_{2.5}$ Standard, Index, and Warning Scheme in Taiwan

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1. Introduction

2014, WHO reports that in 2012 around 7 million people died - one in eight of total global deaths – as a result of outdoor and indoor air pollution exposure. More than 3.2 million deaths/year have been attributed to exposure to PM2.5, which can penetrate deep into the lungs and cause a wide range of health problems. Low- and middle-income countries in the WHO South-East Asia and Western Pacific Regions had the largest air pollution-related burden in 2012, with a total of 3.3 million deaths linked to indoor air pollution and 2.6 million deaths related to outdoor air pollution. Since 1985, Taiwan EPA has used Pollutant Standards Index (PSI) for reporting the air quality for 31 years, but including only PM10 not PM2.5. From 2014 to 2016, Taiwan EPA adapted the 10-scale PM2.5 index system from UK. Recently, replacing the PSI system and 10-scale PM2.5 index system, a new Air Quality index (AQI) system is announced by Taiwan EPA to cover 7 air pollutants including PM2.5.

The objectives of this research are: Evaluate the Early Warning Scheme of Hourly and Daily Fine Particulate Matters (PM2.5) in Taiwan. Discuss action suggestion to sensitive population (children, elders, patients with respiratory and cardiovascular diseases, pregnant women…) when the warning value is reached. Actions of Warning Scheme can reduce the daily exposure of PM2.5, especially for school kids. The Warning Scheme will meet the current Taiwan PM2.5 national ambient air quality standard (NAAQS) 35 μg/m3 24-hr average and 15 μg/m3 annual average, as well as public health impact 55 μg/m3 hourly average suggested by the US EPA.

2. Methodology

The PM2.5 air quality standard (NAAQS) in the US is based on a 24-hr average, as well as many other countries. However, most government agencies use continuous PM2.5 monitors, which provide hourly averages. A question was about how to get the most meaningful 24-hr average from all these hourly values.

- The United States EPA issues early warning PM2.5 24-hr average based on Air Quality Index (AQI) hourly value. The current US AQI for PM2.5 is defined as the most recent 12-hr average combined with the most recent 4-hr average as a substitute of future 12-hr average.
- Japan and Taiwan EPAs adopted different daily PM2.5warming system: to set the early warning PM2.5 daily average value based on 5AM to 7PM hourly average value.

This study investigated the differences between the above two system based on the literatures and the Taiwan air quality monitoring data by regression analysis. The Warning Scheme is developed to meet the current Taiwan PM2.5 national ambient air quality standard (NAAQS) 35 μg/m3 24-hr average and 15 μg/m3 annual average, as well as public health impact 55 μg/m3 hourly average suggested by the United States EPA..

3. Results and Discussion

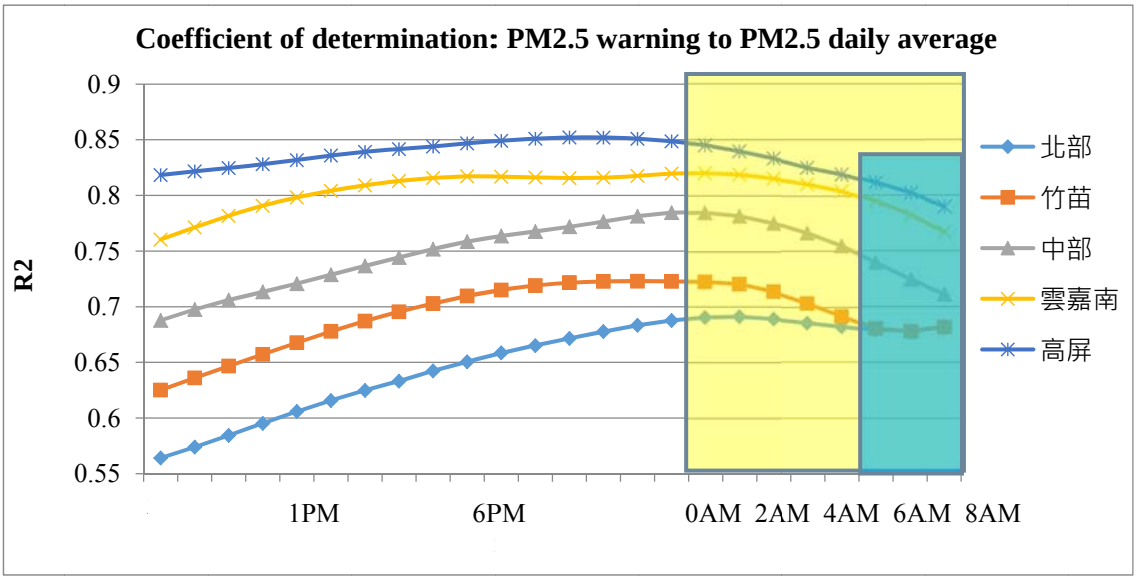

Figure 1. Coefficient of determination for $PM_{2.5}$ daily early warning

In Taiwan, 0AM~7AM hourly average PM2.5 provides a better prediction to daily average than 5AM~7AM, because 5AM~7AM is usually the lowest PM2.5 concentration during a day (Fig 2).

Table 1: $PM_{2.5}$ daily early warning threshold

μg/m^3	Correspond Daily average	Primary-level	Second-level
0~7AM hourly ave.	35	18	33
	55	40	55
5~7AM hourly ave.	35	16	33
	55	36	55

This study proposed Action suggestions for PM2.5 concentration excess 35 μg/m3 and 55 μg/m3, for Healthy adults, Children 3-15, and people with respiratory & cardiovascular diseases..

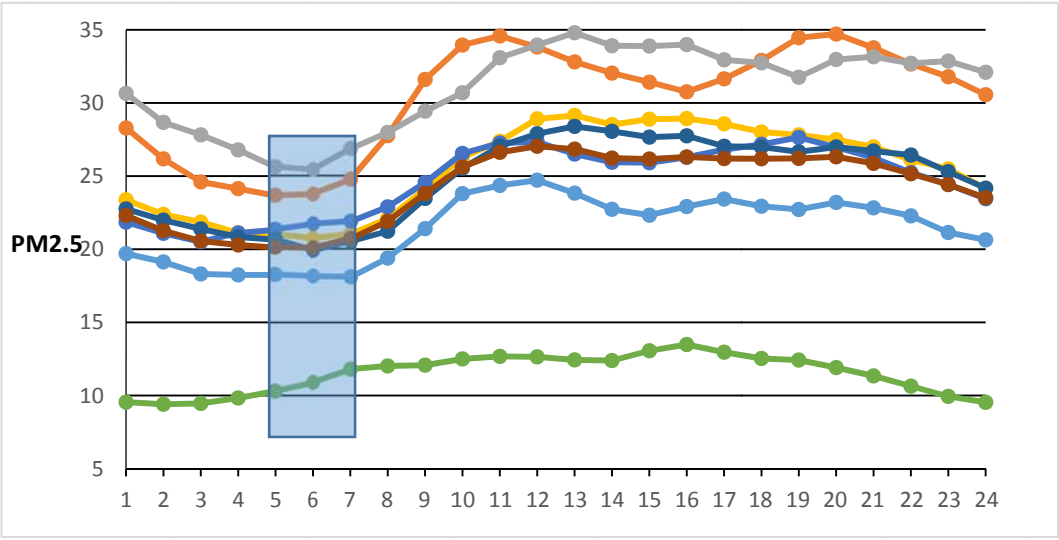

Figure 2. $PM_{2.5}$ hourly average of air quality monitor stations in Taipei City

Key words: $PM_{2.5}$, air quality standard, air quality index, AQI

The Study of Dust Emission Rate of Zhuoshui River by Regression Analysis

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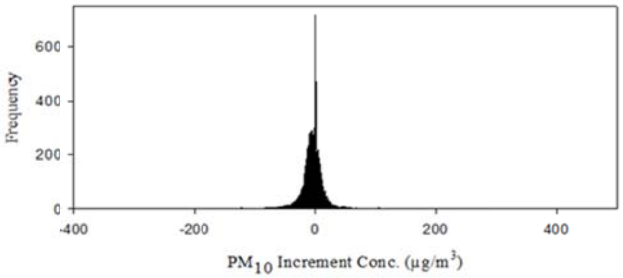
1. Introduction

The wind-driven emission, transport, and deposition of sand and dust by wind are termed *Aeolian processes*. About half of Aeolian dust particles are PM_{10}. When inhaled, PM_{10} particles can travel easily to the deep parts of the lungs and may remain there, causing respiratory illness, lung damage, and even premature death in sensitive individuals. Some researchers reported that the main source of poor air quality is suspended particulate matter which via Aeolian dust emission from bare area of Zhuoshui River in Taiwan. Many researches applied two method to want to know sand movement and dust emission factor. One is using wind tunnels experiment to observed sand movement and calculate the sand emission mass factor. The other one is that collect the data to create formula of dust emission by regression analysis. However, except wind speed, few research focused on the relationship between dust emission and other meteorological parameters. Therefore, this study tried to investigate the effect of other meteorological parameters on the Aeolian dust emission from riverbed.

2. Methods and simulation

First, we tried to select the river dust periods from 2011 to 2015. We counted the differences value of dust concentration between these two stations to represent the influence level from river dust. Then the data should conform two requirement, including that the differences value was greater than positive 2 times standard deviation and the wind speed was greater than 4 m/s, as the dust periods. After that we used WRF to obtain the meteorological factors of those dust periods date. The relationship between dust concentration and meteorological factors was used to set up the multiple regression of PM_{10}. Then we used Gaussian dispersion base model to calculate the dust emission formula of Zhuoshui River. According to the precedent dust emission formula and weather forecast result, this study used AERMOD model to simulate the results of PM10 increment concentration and distribution that was effected by river dust.



(A) 2011

Figure 1. The frequency of PM_{10} increment concentration between Lunbei station and Erlin station form 2011 to 2015.

3. Results and Discussion

Statistic graphs shown that the frequency of PM_{10} increment concentration between Lunbei station and Erlin station form 2011 to 2015. The dust periods was according to the air quality and weather conditions. Including the value of PM_{10} increment concentration was greater than positive 2 times standard deviation, wind direction was from northeast, no rained and the wind speed was greater than 4 m/s. This study investigated the relationship between PM_{10} concentration and meteorological factors. The results indicated that PM_{10} concentration would increase when the relative humidity decreased and the temperature increased. According to the statistical results, the dust emission rate is : $Q=(48.61\times WS+2.39\times Temp-0.76\times RH-190.32)\times u\times 10^{-7}$, where the WS is the wind speed, the Temp is the ambient temperature, the RH is the relative humidity of Lunbei station from WRF and the u is friction velocity. The simulation results of dust transport demonstrated that the average error was less than 50% and better than Taiwan Emission Data System8.1.

Key words: regression analysis, meteorological factors, dispersion, aermod

A Study of Gender Difference in Cost-benefit of Air Pollution Reduction

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1. Introduction

This study assessed the gender difference of on the health effects of criteria air pollutants particulates (PM10, PM2.5), sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO) and ozone (O3). Air Resource Co-Benefit Model (ArCoBModel) was used to conduct a cost benefit analysis on the air pollution reduction policy. In addition, the results were drawn as maps, include air pollution reduction maps, health benefits maps, and premature death maps, which could provide a reference for government to make the policy.

2. Method

In order to estimate the results of air pollution reduction, the Rollbacks model was used to establish the relationships in terms of emission and concentration function, which was regarded as a method to estimate atmospheric capacity. Then, the ArCoB Model was used to quantify the benefits of criteria air pollutants reductions, which could be quantified in term of increase in national lifespan or reduction in medical expenses. Finally, geographic information system (GIS) was used to map the distribution of pollution sources, population distribution and health benefits, and we could understand the effects of pollution intuitively by these maps.

3. Results and Discussion

The health benefits (avoided value of a statistical life loss and medical expenses) of criteria air pollutants reduction were calculated on three case studies. Case 1: Replacing private vehicles with the MRT (Mass Rapid Transit) in Taipei metropolitan could result in health benefits of US$1700 million/year (male) and US$400 million/year (female). Case 2: Replacing natural gas-fired power generation with coal-fired power generation in Taichung power plant could result in health benefits of US$10.1 million/year (male) and US$21 million/year (female) in Taichung area. Case 3: Using power saving technology in Iron and Steel Industry that could result in health benefits of US$0.65 million/year (male) and US$1.3 million/year (female). The reason of higher male health benefits in case 1 is due to the higher O3 mortality for male than female.

Key words: GIS, AERMOD, MRT, Iron and Steel Industry, Cost-benefit Analysis, Thermal Power Plant

Carbon Footprint Assessment of Multimedia Online Services-A Case of Taiwan Mobile Co., Ltd.

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Abstract

Due to the rapid and continuous development of smartphones and mobile network, the cloud computing has gained rapid application in recent years. Through a variety of cloud services applied to basic necessities of life, people can enjoy more convenient and smart lifestyle. In Taiwan, about 14.32 million of people have smartphones, and in this huge case of information and communication technology (ICT) products, is also accompanied by the amazing energy consumption. There are a lot of studies on the environmental impact or carbon footprint of e-books, online video rental, games and other cloud services, but rarely investigated in Taiwan.

In light of the facts mentioned above, this study intends to investigate the carbon footprint of multimedia online services by Taiwan Mobile's myMusic, myVideo and myBook. Through different scenarios to find out the carbon footprint for differences caused by the different network transmission types when consumer use 3G mobile network or 4G mobile network. The functional unit used for 1MB of data transferred across Taiwan Mobile by consumer. In this study, LCA software SimaPro 8.0.2 was used to assess the carbon footprint of multimedia online services. The carbon footprints of multimedia online services are 0.42 gCO_2e(3G) and 0.37gCO_2e(4G), the network traffic weighted average is 0.39 gCO_2e for myMusic; 0.43 gCO_2e(3G), 0.38 gCO_2e(4G), the network traffic weighted average is 0.4 gCO_2e for myVideo; 0.64gCO_2e(3G)、0.59gCO_2e(4G) and the network traffic weighted average is 0.61 gCO_2e for myBook. The results indicate that, service stage's network transmission has the highest carbon footprint, especially 3G mobile network higher than 4G mobile network, and the main energy resource consumption-based electricity. Therefore, the telecommunications industry should seek to enhance energy efficiency, buying green electricity, environmental information disclosure, map out effective energy management and environmental management objectives to achieve environmental sustainability.

Keywords: Carbon footprint, Life Cycle Assessment, Multimedia Online Services

Material flow analysis of Neodymium in Taiwan

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1. Introduction

Recently, issues related to rare earth are discussed more frequently, which are mostly applied on industries such as innovative and green technology.They are also critical raw materials for prioritized development of electrics, machinery and electronics industries in Taiwan, and also have a reputation as "Industrial Vitamin in 21st Century".Electrical and optical industries are critical and key industries in Taiwan and the materials such as Neodymium (Nd) is significant for these industries. That operation cost is extremely sensitive to price fluctuation of rare earth due to China government set up quota for exporting of rare earth. Taiwan is an island state. which heavily relies on foreign mineral resources, if the material flow and resourcezation value of wasted materials such as Neodymium (Nd) for electrical and optical industries could be deeply investigated, which would have benefits for governments to plan storage system and also for resourcezation industry to determine recycling of resources.

2. Experimental

The purpose is to establish the material flow system of Neodymium in Taiwan, coupled with the material balance model.

1. It is necessary to decide the target and the margin of time and space before using MFA method. Boundary: Taiwan Time: 2011 year Components：Import, Export, Industrial manufacture, Waste recycling system.
2. It needs to take into account the present regulatory governance within the economy in order to improve the accuracy of statistical simulation.
3. In order to construct the system and confirm the stocks and flows within this system, it needs to acquire information widely, such as paper review, market research, expert judgment, best estimates and interviews.
4. When some data are not acquired, the mass balance, i.e., mass-in is equal to mass-out, can be used to balance the materials.
5. To interpret the results of MFA analysis for Neodymium use in Taiwan. The Neodymium uses can be grouped into 5 categories: imports, exports, usage for other industrial production, wastes, and reuse.

3. Results and Discussion

1. there are almost 109.8 tons of (Nd) metal can be recoveryed from industrial wastes .It is presumed that the value is NTD$ 8,000 per kilogram for recycle benefits assessment, and the recycle of wasted (NdFeB) magnets could create benefits around 878 million NT dollars per year.
2. There are no Neodymium(Nd) ores to mining in Taiwan, the metal of Neodymium(Nd) and other related products import all by other countries then manufacturing relate products of Neodymium(Nd).
3. Taiwan and Japan doesn't have natural ores, so the issue of urban mining become crucial. And material flow analysis can help us to realize the recycle of metals. In the meantime, recycling can also reach the energy conservation and carbon reduction.

Key words:rare earth elements,material flow, Neodymiumin

Practice and Action of Enterprises in response to Circular Economy - Experiences of International Sustainable Enterprises

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[a,b,c]

Abstract

It is estimated that by 2050 will reach 9 billion as the global population continues to increase, it will lead to accelerate consumption of natural resources and the pressure of resource is going to deplete. The traditional linear economic model is taking - making - disposal, but this model is not sustainable, so the development of circular economy is very important in the future. According to Ellen MacArthur Foundation advocates the circular economy can be divided into industrial cycles and biological cycles. There are six major development opportunities, ReDesign, Circular Processing, Circular Agriculture, Closing the Loop, Collaboration / Symbiosis /Sharing, and Innovative Business Model. According to the experience of the EU, if a company adopts the circular economy into the governance strategies, such as: Waste Prevention Program, Extending the lifetime of products through reuse and repair, Material Recycling, and Products Redesign, the company can increase an average of 3–8 % of annual turnover. Ellen MacArthur Foundation proposed three principles for circular economy, including "Preserve and enhance natural capital, Optimise resource yields, and Foster system effectiveness." The EU believes that the success of circular economy has four elements," innovative business model, eco-design, through re-use and repair to extend product life, and waste reduction program". The International enterprises have some successful cases of circular economy, such as: Philips do not sell bulbs to sell lighting, Dow Chemical solve the plastic problems by the energy bags and so on. In order to understand the link between Taiwan enterprises and circular economy, and what's the action and practice should Taiwanese enterprises adapt to get green competitiveness, this research use much literature review, and how international enterprises practice toward circular economy in the case studies. Through the exploratory research to find what's the suitable circular economic model for domestic enterprises and also provide some references for Taiwan enterprises.

Transformation of phosphorus in sewage sludge by the addition of calcium hydroxide

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Abstract

Sewage sludge (SS) is the by-product of wastewater treatment. Phosphorus (P) in SS can be divided into five types, including total phosphorus (TP), inorganic phosphorus (IP), organic phosphorus (OP), non-apatite phosphorus (NAIP) and apatite phosphorus (AP). However, only AP has a high bioavailability and a wide range of industrial application. In order to improve the recycling of P is SS, it is necessary to transfer different types of P to AP. This study attempted to achieve this objective by the addition of calcium hydroxide ($Ca(OH)_2$). The effects of $Ca(OH)_2$ dosage, reaction temperature, and reaction time on the transformation of P to AP were investigated.

The results showed that with the addition of more than 8 wt.% $Ca(OH)_2$ at 25℃ for 1 day, the content of OP and NAIP in SS decreased whereas that of AP increased. As the reaction temperature increased, OP and NAIP decreased furthermore. When the reaction temperature reached 300℃, the content of OP was near zero, which suggested that OP was fully transferred to AP. The effect of the addition of $Ca(OH)_2$ on P transformation in SS was confirmed.

Keywords: *Sewage sludge, Phosphorus, Transformation, Thermal treatment*

A Study of Circular Economy and Development Urban Mine in Asia

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1. Introduction

In recent years, technology developed rapidly. It caused many international problems such as climate change, population growth and the consumption of materials. At the same time, to solve the problem of waste and to use the materials more efficient. We start to develop CIRCULAR ECONOMY, to keep the materials can be use sustainably.

2. Experimental

The density of population in Taiwan is very high so that the capacity of land is not enough. Otherwise, the technology and industry are develop dramatically so the land become lack of natural resources and energy resources, which are highly dependent on imports. To decrease the import amount of resources. We have to reduce the materials of products, reuse the products and recycle the waste. Let the material flow in a circle over and over again.

However, circular economy cannot be reached in a short time due to it' s integrative planning. Fortunately, the achievement of environmental protection in Taiwan is extraordinary. It created a strong foundation for the development of circular economy, especially in the waste management system, with the most international recognition. Basic on this reason, we combine the E-Waste treatment and urban mining to make Taiwan promote circular economy efficiently, can not only recover valuable metal like gold, silver and palladium, but also rare metals like cobalt, barium, bismuth and strontium. Recycling urban mine can reduce the environmental impact from E-Waste and make resources recycling sustainable.

3. Results and Discussion

This study was made by using text analysis and showed the value of product, and illustrated television, refrigerator, washing machine, air condition and cell phone. First, to calculate the value of urban mine in Taiwan, Japan, China, and Southeast Asia in order to assess the urban mine potential in Asia. Second, to help the industry in Taiwan to transform into eco-industry. Finally, to promote the development of circular economy in Asia.

KEYWORDS: Circular Economy, Urban Mine, E-Waste Management, Rare Metals, Green Fund, Sustainable Development

A study on characteristic of street dust associated with ambient $PM_{2.5}$

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1. Introduction

According to the Executive Department of Transportation statistics, the number of mobile vehicle is 21.4 million in Taiwan. The study shows that the level of concentration of suspended particles and human health are closely related, as the number of mobile vehicle growth, also increased the risk of human exposure. According to information provided by the Environmental Protection Administration, a total emission of $PM_{2.5}$ is 73,855 tons in 2010, Taiwan. This study purpose to study silt characteristics of the metropolitan area of the road in order to learn the extent of the effects of air concentrations of fine suspended particles and find the concentration of fine suspended particles caused by street dust in paved road.

2. Experimental

First select the sampling streets, and then calibrate the instrument before sampling. Followed by sampling particulate pollutants and using TOPAS collecting a background value. Figure 1 shows street dust raised simulations. In this study, based on the laboratory test samples to the road for many years in New Taipei City, Taiyuan Street of dust load analysis with the 0.6 mg/m², 1.2 mg/m², 1.8 mg/m², 2.4mg/m², 3.0 mg/m², and simulate disturbance wind speed 3 m/s.

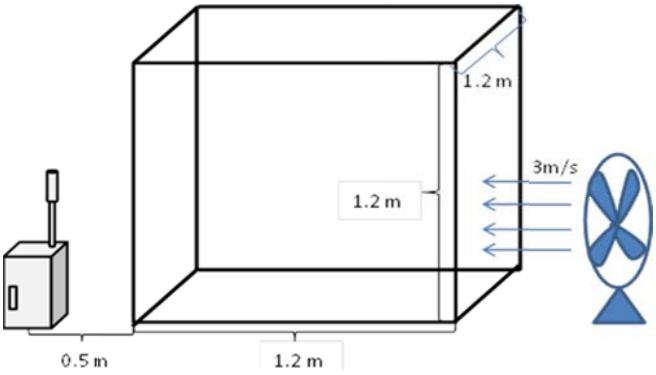

Figure 1. Street dust raised simulation device

3. Results and Discussion

The experiment of the paved road could not find the relationship between the silt weight and the concentration of $PM_{2.5}$, however, there were some relationship between the fine silt weight and the concentration of $PM_{2.5}$ and the experiment showed the correlation R^2=0.9294. It meant that the fine silt of ground would affect the concentration of $PM_{2.5}$ directly. After fine silt 0.6 mg/m2 completely raised gets the theoretical perimeter air $PM_{2.5}$ concentrations is 500 μg/m3, and the actual value of the measured concentration of $PM_{2.5}$ only 8.47 μg/m3 by the following average, the actual concentration value and the theoretical concentration values obtained after the division was 1.7%, silt in fine particle size of 0.6 mg / m^2 of at 2.5μm or less accounted for about 1.7%; 3.0 mg/m2 is 8.9%. The fine silt of ground contributed to the concentration of $PM_{2.5}$ approximately 1.7~8.9 %.

Key words: Street Dust, Street sweeping, Silt loading, PM2.5

Management and cost analysis of desalination plant

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1. Introduction

Desalination has been the film technology and especially the infiltration technology is due to the need for additional pressure, which is a low energy desalination technology, by separation technique to extract and membrane water separation and reuse. The application of forward osmosis technology with low energy consumption and low fouling tendency in water treatment can improve the recovery stability and cost-effectiveness of seawater desalination system. How to make the best use of FO, which need reasonable management and cost control [1]. Desalination plant to operate effectively, the commonly used BOT(Build - operate - transfer) model, which is private funding for construction, and the government chartered by private companies in a certain period has the right to operate on a cost recovery to obtain benefits, such as the expiration of the duration after the transfer of management rights to the government. But this model is more difficult to attract private enterprises, and the need to carefully assess the financial capacity of bidders, too many uncertainties, operational risk is too large. In order to make up for the shortage of BOT model, in recent years, there has been a new financing model-PPP (Public-Private- Partnership) model, which is the cooperation mode between public and private enterprises. PPP model is an optimum way in public infrastructure project financing and implementation mode, which is a kind of parties involved in the "win-win" concept of cooperation for the modern financing mode[2].

2. Method

To manage the desalination using PPP model, establish a sound management system, to control the risk of operation. The problem based on the cost budget accuracy of desalination and uncertainty can not take into account which cost budget method based on neural network, this method firstly analyzes the construction of desalination plants and key factors of operating costs, including construction period, construction area, film costs, equipment costs and energy consumption; and the establishment of influence to quantify the effects of expression factors, and the quantization result is taken as input and the cost budget is output.

3. Results and Discussion

In this paper, we show that the PPP model can eliminate the cost overruns and allocate the risk reasonably. Using the analysis model of cost control in the process of construction costs, reduce the cost of consumption, to control the cost effect The effective control cost can be reduced by about 18.3%, although still practice stage desalination FO, but as long as the reasonable management and control, the future will become the mainstream of FO desalination.

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[2] R. Leiringer, Technological innovation in PPPs: Incentives, opportunities and actions, Construction Management and Economics, 24 (2006) 301-308.

Key words: FO, Desalination, Public-Private-Partnership model, Neural Networks