行政院所屬各機關因公出國人員出國報告書

(出國類別：開會)

參加「2011 年永續資源管理廢棄物國際研討會」(Moving Towards Sustainable Resource Management International Conference on Solid Waste 2011) 出國報告

服務機關：行政院環境保護署

姓名職稱：賴瑩瑩副處長

派赴國家：香港

出國期間：100 年 5 月 2 日至 100 年 5 月 8 日

報告日期：民國 100 年 7 月 1 日

摘要

「2011 年永續資源管理廢棄物國際研討會」由香港浸會大學主辦，自 5 月 3 日至 6 日於舉行，有將近 400 名來自德國、義大利、中國大陸、澳洲、泰國、新加坡及印度等 30 多個亞洲、非洲和歐美等國家地區的專業人員，其中不乏官方代表，就廢棄物處理問題爲經濟、環境、社會各方面所帶來的挑戰和機會進行分享和交流，共計發表 199 篇論文，並進行多場專題演講。

我國過去在都市廢棄物管理、資源回收、垃圾費隨袋徵收、綠色消費等政策有豐富的經驗及顯著的成果。故推派代表與會報告，一爲進行專題演講， 報告「臺灣一般廢棄物減量及回收現況與政策」另一爲在公共論壇中報告「台北市推行垃圾費隨袋徵收經驗」。希望透過該研討會提供我國實施經驗，並交換心得，及了解其他國家實施情形。

早期我國係參考歐美先進國家之廢棄物管理原則爲主，推動多年的經驗發現，應考量社會文化、飲食習慣、或地理環境等因素，並從本身的垃圾收集及清運體系中的環節適當地施以經濟誘因或法令強制等政策工具，始爲有效。我國並發展出垃圾不落地、垃圾分三類的分類及收集體系、廚餘資源回收體系等特殊作法。爲與會人士有高度興趣並多所詢問。會議期間並與香港、澳門、菲律賓及德國之官方代表有較多的互動。

此次研討會亦聆聽目前歐盟對資源循環利用的最新的發展趨勢，包括歐盟的「廢棄物架構指令」(Waste Framework Directive)，以及德國循環經濟在未來與資源效率(resource efficiency)、回收稀有金屬(critical raw materials)、城市礦山(urban mining)及減少溫室氣體排放等幾個議題相連結，以上均值得我們再密切注意。

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壹、目的

2011 年永續資源管理廢棄物國際研討會(The International Conference on Solid Waste 2011 Moving Towards Sustainable Resource Management,ICSW 2011) 係由香港浸會大學主辦，係鑑於自然資源的日漸匱乏及廢棄物問題，已造成全球社會、經濟及環境發展的重大挑戰，廢棄物管理介於物質社會、資源管理生活方式及消費型態的改變，生態等議題間，有很多不同面向的討論。故邀請來自學術界、業界、政府及非政府組織的代表，討論各國的情形，可交換經驗及對政策技術及學術發展、財務需求及社會改變有更好的了解。

我國過去在都市廢棄物管理、資源回收、垃圾費隨袋徵收、綠色消費等政策有豐富的經驗及顯著的成果。故推派代表與會報告，希望透過該研討會提供有關台灣的實施過程，並交換經驗，也可了解其他亞洲國家實施情形。

貳、行程

一、 計畫類別：受邀赴香港報告我國一般廢棄物減量及資源回收政策

二、 前往國家：香港

三、 出國期間：100 年 5 月 2 日至 5 月 8 日，計 7 天

四、 行程表

日期	地點	行程
5/2 (一)	台北→香港	啓程
5/3 (二)	香港	一、參加研討會並報告「臺灣一般廢棄物減量及回收現況與政策」 二、歡迎晚宴
5/4 (三)	香港	參加研討會
5/5 (四)	香港	一、參加研討會 二、參加公共論壇並報告「推行垃圾費隨袋徵收經驗」
5/6 (五)	香港	參加廢棄物處理考察行程
5/7 (六)	香港	香港停留
5/8 (日)	香港→台北	返程

參、與會過程及內容

一、 會議概況

「2011 年永續資源管理廢棄物國際研討會」(The International Conference on Solid Waste 2011 Moving Towards Sustainable Resource Management,ICSW 2011) 由香港浸會大學主辦，自 5 月 3 日至 5 月 6 日於香港會議展覽中心(Hong Kong Convention and Exhibition)舉行，匯集了近四百名來自德國、義大利、中國大陸、馬來西亞、菲律賓、泰國、新加坡及印度等三十多個亞洲、非洲和歐美等國家地區的專業人員，就廢物處理問題爲經濟、環境、社會各方面所帶來的挑戰和機會進行爲期三日的分享和交流。

開幕典禮上邀請香港特別行政區環境保護局副局長潘潔博士太平紳士、德國水資源/廢棄物管理及土壤保護部長 Dr. Helge Wendenburg、浸大副校長黃偉國教授和浸大嘉漢林業珠江三角環境應用研究中心主任黃煥忠教授等四位專家學者致詞，透過他們精闢的簡介展開序幕。會議上 Dr. Helge Wendenburg 和本署代表賴瑩瑩副處長發表開幕演說，Dr. Wendenburg 分享歐盟在減少及循環再用廢物的策略及循環經濟在德國政府資源策略上的角色，賴瑩瑩副處長則分享了台灣如何向可持續發展社會邁進、以及減少和循環再用城市固體廢物的主要措施。

本次研討會投稿論文共計 199 篇，其中現場發表者計 133 篇，張貼者計 66 篇。接著分別以四間會議室進行不同議題的討論。一連三天的會議中，多個地區或國家的代表就最新廢物管理政策及教育推廣個案、廢物循環再用、熱能處理技術、堆肥、生物能源、生物處理以及掩埋管理等題目分享報告。最後一天下午並舉行公共論壇，開放各界自由報名參加，讓來自台灣、德國、香港的官員、學者和物業管理業者直接交流，務求把都市垃圾處理的成功案例應用到香港。

研討會論文類別如下，研討會及公共論壇議程如附件一及附件二所示：

- Countries' Perspectives
- Anaerobic Digestion
- Landfill Management
- Waste Recycling for Construction
- Waste Management

- Special Waste Treatment
- Thermal Technology
- Sludge Management
- Organic Waste Management
- Composting
- Education and Awareness
- Waste Recycling Policy
- Waste Recycling in Developing Countries
- Bioenergy
- Waste Recycling
- Biological Treatment
- Industrial Waste Treatment

二、 專題演講

本次本署受邀擔任二部分，一爲專題演講人(keynote speaker),另一爲在公共論壇(Public Workshop)中就台灣的實施經驗擔任引言人之一。爲能讓與會各國人員可充了解我國推動情形，故分別以全國及台北市的推動經驗，報告「臺灣一般廢棄物減量及回收現況與政策」及「台北市推行垃圾費隨袋徵收經驗」。

第一部分「臺灣一般廢棄物減量及回收現況與政策」(The Status and Policy of MSW Reduction and Recycling in Taiwan)的專題演講主要將我國自 70 年代開始，過去一般廢棄物引起爭議的議題、廢棄物管理制度變革的歷程、現行廢棄物回收清除處理架構、零廢棄政策內容及目標、採行的政策工具、成功的關鍵因素及各主要措施的內容、及未來展望等進行報告(摘要及發表的投影片如附件三)。

有關本署的專題演講發表內容，由於是在開幕典禮後進行的第二個演講，參加本次研討會的主要貴賓，都還在會場，且此次有三十多個亞洲、非洲和歐美等國家地區的政府官員、學術機構及專業技術人員參加，特別是中國大陸、香港、澳門、菲律賓、新加坡及印度等亞洲國家，因社會文化及飲食習慣較爲接近，故對我國在會上分享台灣如何向可持續發展社會邁進、以及減少和循環再用城市固體廢物的主要措施，有高度興趣，會後紛紛詢問。至於德國代表，認爲我國用自己的方法推動物質永續循環利用，頗感興趣。

第二部分的報告「台北市推行垃圾費隨袋徵收經驗」(Implementation of the "Pay Per Bag System" in Taipei City)，將台北市推動前的背景、以 SWAP 分析方法評估制度實施之優勢、劣勢、機會及威脅、實施前的規劃、實施前的準備工作、推動的方法、實施內容、實施成果、檢討與展望等報告(發表的投影片如附件三)。

公共論壇係因如何減少廢棄物的產生是目前香港的重要議題，而香港物業管理業又是其中的關鍵角色，故主辦單位以如何促進物業管理業永續廢棄物管理爲題，包括廢棄物管理策略、分類及收集方式、社區民眾如何參與及宣導教育計畫、廚餘就地處理方式等，邀請香港環保署、我國環保署代表及環境教育學者葉欣誠教授、德國技術顧問機構代表、香港浸會大學代表分別報告香港及我國廢棄物管理政策及實施情形、如何讓公眾參與垃圾分類，及二位物業管理業者報告垃圾管理案例，並開放讓大眾參加討論。

由於香港政府僅以鼓勵及宣導方式，在公共場所、住宅高樓商業大樓等設置資源回收桶，尚未實施有效的資源回收計畫。每日生活垃圾產生量爲18,000 噸(相當於 2.52 公斤/人天，2009 年) ，資源再生率爲 49%，未回收的垃圾全部進三個掩埋場處理，而掩埋場只有 3-7 年的使用期限，規劃於 2018 年興建 3000 噸/日處理量的垃圾焚化廠。主要實施的生產者責任計畫爲 2008 年通過的”產品環保責任條例”，其中之一即爲於 2009 年 7 月實施的”塑膠購物袋環保徵費”，廢電器及電子產品回收法令則於 2010 年 1 至 4 月公開諮詢。

但因尚未實施垃圾收費，無法藉由經濟誘因工具進行垃圾減量，故當地的環保團體及學界對香港政府有很強的批判。會中及會後，環保團體綠領行動(前綠色學生聯會)幾位代表即相當有興趣，特別對台北市的垃圾費隨袋徵收方式、資源回收減量情形多有詢問。

由於澳門及香港均有主管廢棄物管理的高階主管參與本次研討會，故亦於其他時間另安排討論，其中曾與香港環境保護署助理副署長、廢棄物管理首席主任及相關同仁交換我國過去實施經驗。

在澳門部分，近幾年積極發展觀光業，觀光客大爲增加，且預估未來亦會有成長，故垃圾減量及處理方式亦是一個需加強改進的工作，此次民政署

副主任委員、環境衛生處處長及相關同仁亦參與研討會，特別是我國的實施經驗足供其借鏡，故於研討會期間又另約時間以深入交換我國實施經驗。

三、 重要論文摘述

研討會主辦單位安排的專題演講囊括資源循環經濟的永續發展、生質能的應用與發展，並將各國投稿論文分爲四個主要部分，包括廢棄物管理政策、掩埋場管理、厭氧醱酵、營建廢棄物回收、特殊廢棄物處理、熱能處理技術、污泥處理技術、有機廢棄物處理、堆肥、教育與認知、生質能等面向。以下就幾個重要的報告進行說明，簡報資料如附件四。

(一)Circular Economy in the European Union and in Germany: Contribution to Resource Efficiency and Climate Protection" , Dr. jur. Helge Wendenburg , Director General, BMU, German Federal Ministry for the Environment, Germany)

由德國環境部 Water Management, Waste Management, Soil Conservation 司長 Wendenburg 博士報告「歐盟及德國循環經濟對資源效率及全球氣候變遷的貢獻」，循環經濟(Circular Economy)在德國政府的資源策略中佔有很重要的一環，自 1990 年代即開始將廢棄物管理朝向循環經濟(Circular Economy)模式，1994 年實施的 Closed Substance Cycle Waste Management Act 即已明確指出資源再生優於最終處置。目前有有 70%的都市垃圾資源再生，60%的家戶垃圾資源回收。資源回收的成功也顯著地改善氣候變遷的情形，德國廢棄物部分對溫室氣體減量的貢獻相當顯著，到 2006 年，廢棄物部分估計有 280 百萬噸的 CO2 減量，相當於 20% 。

其最主要的政策工具即爲生產者責任制(product responsibility)，主要實施項目爲包裝、廢車、電子產品及乾電池等。2005 年並規定未經處理的垃圾禁止進入掩埋場。前述目標及實施情形也符合歐盟的回收社會(recycling society)目標，及「廢棄物架構指令」(the Waste Framework Directive on waste, WFD,

2008/98/EC)。

德國也打算修改目前的封閉循環物質管理法，未來的法令將包括以下幾個重要的規定，排除廢棄物的認定原則、五階段廢棄物管理順序、廢紙、金屬、塑膠及玻璃有機廢棄物的強制分類、圾垃的再使用及資源回收率爲 65%、營建廢棄物爲再生率爲 80%、推動全國性的源頭減量計畫、再就將目前垃圾中未分類出的物質考量如何進行資源回收等，詳如下列：

- end-of-waste criteria,
- 5-step waste hierarchy,
- the nationally wide obligation to the separate collection of paper, metal, plastic and glass starting from 2015,
- the separate collection of biowaste starting from the year 2015,
- the targets on preparing for re-use and the recycling of municipal waste (65 %) and recovery of C&D waste (80 %),
- the introduction of a national programme for waste prevention,
- the introduction of an extended collection scheme for non-packaging materials (Wertstofftonne, bin for recyclable materials) in order to exploit the fraction of recyclable materials – currently estimated to amount to approx. 7 kg p.c. p.a. – which are streamed until now as residual waste to the less favourable option of disposal.

要達到以上的目標需要更多的技術創新及持續推動循環經濟，不過最大的挑戰是如何轉換爲經濟需求。爲了實現綠色經濟的觀念，在政治上要能配合通過法令，相關的責任者要能符合污染者付費原則。

因全球天然資源的有限性的問題日趨嚴重讓廢棄物管理面臨新的挑戰，但也提供了技術創新及有效的資源再生過程一個新的機會，資源價格的提高也讓資源回收工作的推動更有利潤。循環經濟在 90 年代開始即與全球議題有密切的關係，特別是永續發展（綠色經濟）、氣候變遷及資源效率。未來更會與資源效率、回收稀有金屬、城市礦山(urban mining)及減少溫室氣體排放等幾個議題有很大的關係，亦是極具挑戰。

(二)"Recycling of Packaging Waste and Other Recyclables – A Contribution to Resource Productivity" ,Mr. Thomas Schmid-Unterseh , German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany

德國包裝容器的資源回收報告者爲德國實際負責包裝法令的科長，故除了過去已知的實施情形，也藉由其報告了解一些推動的關鍵過程。永續發展的廢棄物管理係爲減少空氣、水、土壤及人體健康的衝擊，對資源生產率的推動日漸重要；廢棄物避免、再生及資源回收仍然是推動循環經濟的重要的一部分。封閉物質循環經濟的主要策略爲，明定廢棄物處理責任(家戶爲地方政府、其他爲私部門的責任)、延長生產者責任、可再生物質的分類收集、擴充回收設施、廢棄物轉化爲能源的最適量、掩埋場禁止未處理的廢棄物等。至於達到的成果，自 1993 年開始推動已超過 80 百萬噸的回收物，對資源回收技術及回收容量的擴增、高的資源回收率及對溫室氣體減量的顯著貢獻。

過去被垢病的問題爲獨佔市場及成本太高的情形已改善，已由開始時只有一個 “dual system” 時成本爲 2 billion 歐元/年，透過市場競爭，有 9 個 “dual system” ，故成本降爲 2 billion 歐元/年。但規避繳費(free riders)問題仍存在。

由過去的推動可知，EPR 及高的回收率已帶動收集設施、分類技術及資源回收的量能；現代先進的技術已改善二級原料的品質；亦有助於二級原料市場的發展；競爭對效率而言是重要的；明確的法令規範對公平的競爭、有效控制及依法實施亦是必需要的。

對於包裝法令社會仍在討論的議題包括，所有的地區都要收集?所有的家戶包裝廢棄物都要收集?由私人公司收集或由地方政府收集?要選擇資源回收還是能源再生?資源物要分開收集或是與其他的都市垃圾一起收集?

(三) "Energy Efficiency of Substance and Energy Recovery of Selected Waste Fractions" Prof. Klaus Fricke, Professor and Chair, Waste Management Department of Leichtweiß-Institute at Technical University of Braunschweig, Germany

本報告爲德國 Braunschweig 科技大學 Fricke 教授所進行的研究結果，爲了降低資源開採對生態環境的衝擊，歐盟已提出爲達到永續發展，要提高自然資源使用的效率及生產率。這個目標只能藉由全面考量如何從廢棄物資源再生而達到。故廢棄物管理措施必需深入探討，從各方面在物質資源回收及能源再生以求達到平衡。過去對於要選擇物質回收、能源再生或最終處置有一些討論，本篇研究係將紙、塑膠(LDPE)及有機廢棄物，以資源效率、對氣候變遷的影響效果及經濟效率爲因子進行比較，以找出哪一個是最永續的管理策略。研究結果發現，以上所探討的這些項目，物質回收優於能源再生，也有較低的溫室氣體排放。

(四)Survey and Analysis of Knowledge, Attitude, and Behavior in Waste Management of the General Public in Taiwan

由我國師範大學環境教育研究所所長葉欣誠教授於本次研討會發表「台灣民眾對廢棄物管理的知識、態度及行爲的調查與分析」報告。我國的資源回收率由 1998 年的 3.96%，提高到 2009 年的 37.35%，推動過程中的教育宣導、推動方式及溝通策略，及社會大眾的配合扮演了重要的角色。故葉教授應用 Hines 的行爲科學模式，以了解在我國經過 14 年的努力後，透過超過 1000 份的問卷調查，社會大眾在垃圾分類資源回收的知識、態度及行爲爲何。超過 50%的受訪者表示，資源回收工作以落實在日常生活中；但其中有一些受訪者不了解”先源頭減量再資源回收的管理順序”；居住在北部的受訪者，特別是台北市，在源頭減量資源回收的態度及行爲上有較好的表現；同時也發現，在台灣很多大作資源回收是因爲宗教的因素；經濟誘因及鄰居的壓力是受訪者願意配合地方政府的規定進行資源回收的因素。

（五）“Hong Kong’s Waste Management Challenges”, Dr. Alain Lam, Environmental Protection Department, HKSAR Government

香港環保局首席環境保護主任林國麟博士報告香港現行廢棄物管理現況及未來展望。香港都市廢棄物包括住宅及工商業活動所產生之廢棄物，2009 年垃圾清運量約爲每日 18,000 公噸，除資回收外，全部以掩埋方式處理。環保局已提出都市固體廢棄物管理政策大綱(2005-2014 年)， 包括一系列的政策措施落實「污染者自付」的原則和環保責任的理念，並提出以 2003 年爲基準，每年減少產生的都市固體廢物量 1% 之目標。目前主要推動情形如下:

1.提出生產者責任計畫，即所有與產品有關者，包括製造商、進口商、分銷商、零售商和消費者分擔產品使用後妥善管理的責任。其中《產品環保責任條例》已在 2008 年 7 月獲立法會通過，爲引入生產者責任計畫提供法律

基礎，塑膠購物袋環保徵費是該條例下首個生產者責任計畫，並已於 2009 年 7 月 7 日起實施。

2.在 2010 年就廢電器及電子產品廢電器及電子產品的立法方案諮詢公眾和業界。

3.規劃都市固體廢物收費，以符合污染者自付的原則，已進行基線調查，收集不同工商機構產生和管理廢物方式等主要資料，以發展一套實際可行的都市固體廢棄物收費計畫。

4.推動環保園區，爲回收業提供長期用地，支援當地循環再造業的發展，已於 2009 年完成第一期，預計於 2011 年完成第二期。

5.規劃興建綜合廢物管理設施，目的爲減少九成的混合都市固體廢棄物體積及回收能源，以焚化爲核心技術，並設有一座試驗規模的分類和回收設施 ，2018 年第一階段設施的處理量爲每日 3,000 公噸。

四、 現場參觀

5 月 6 日主辦單位並安排二個行程的現場參觀，行程如下，主要參觀牛潭尾動物廢料堆肥廠及仁愛堂環保園塑膠資源再生中心:

08:30 Depart from Wan Chai

09:15 - 10:15 Animal Waste Composting Plant at Ngau Tam Mei

11:15 - 12:30 Hong Kong EcoPark, Management and Tourist Centre Tenant 1: Yan Oi Tong EcoPark Plastic Recycling Centre

(一)牛潭尾動物廢料堆肥廠

第一站到達牛潭尾動物廢料堆肥廠，此堆肥廠完工於 2008 年 7 月，主要用於處理當年奧運會及殘疾人奧運會馬術項目所產生的馬廄廢料，建造經費爲港幣 3,700 萬元，設計處理量爲每日可處理約二十公噸馬廄廢料，包括馬糞、稻草或紙類墊料、馬匹飼料等。

此堆肥廠使用密封式堆肥法，密封式堆肥是在一個完全密封的裝置內進行，優點是可讓製造的堆肥質量更穩定、減少使用混合料、能有效控制氣味，因過程可能產生的臭味較易收集作除臭處理及用地範圍較其他堆肥方法爲小，同時可更有效控制堆肥過程中的水分含量及溫度。

處理流程爲首先將馬廄廢料運送至堆肥廠內的前期處理廠房作含水量測試。接著放進進料斗經鐵金屬分離機、非鐵金屬分離機和轉盤分離機將廢物中的含鐵金屬、非鐵金屬成份和含塑料物質去除。馬廄廢料經攪碎機攪碎後，經輸送機運至密封式滾筒堆肥機作 3 至 4 日堆肥處理。半成熟的堆肥運至堆肥棚進行 42 至 45 日的熟化程序。最後，成熟的堆肥經測試符合合約標準後便可出售。

(二)仁愛堂環保園塑膠資源再生中心

第二站是仁愛堂環保園塑膠資源再生中心，2010 年 3 月正式啓用，仁愛堂是社福機構，透過環境及自然保育基金的公開甄選程序，被揀選管理和營運環保園塑膠資源再生中心。此中心營運目的爲廢物源頭分類計劃所回收的廢塑膠提供合符環保原則的出路，把廢塑膠回收並轉化爲可銷售的高增值再生物料，減輕堆填區的負荷。中心會將收集到的廢塑膠分揀、清洗、加工處理成塑料膠片或膠粒，然後透過公開招標售回現存市場業界，用以製造有用的產品。

此中心設有四個廠房，分別處理不同階段工作，首先是預洗及分類區，廢塑膠進入此區後先行預洗及消毒，再由經驗豐富的分類員根據塑膠種類及顏色進行分類；第二階段爲破碎及清洗區，將上一階段分類完之單一物料進行破碎以及二次清洗；第三階段爲造粒區，因應市場需要，上階段破碎後之碎片可再加工熔化、切成條狀及切粒製成粒狀塑料，最後是儲存區，所有成品均會放入此區儲存，以避免成品受潮影響品質，處理後的廢塑膠由原本數百元一噸提升至三千元一噸的價值，去年平均每天約處理 3 噸廢塑膠，後續希望可提升至每天處理 20 噸廢塑膠。

肆、結論與建議

一、我國過去推動相關工作係採循序漸進方式，成功的關鍵因素包括:1.垃圾減量與資源回收長期的教育及宣導工作；2.首長的推動決心、政府團隊縝密規劃與各部門充分配合；3.中央及地方議會、媒體與環保團體的全力支持；4.垃圾清運、資源回收方式及再利用管道已通暢與健全；5.實施經濟誘因的政策工具，包括環保署所成立的資源回收管理基金及在台北市新北市的垃圾費隨袋徵收制，可提供民眾爲減輕負擔或因有實質的經濟誘因，故積極配合源頭減量減少垃圾產生、及垃圾分類及資源回收工作。以上已提供與會其他國家廢棄物管理政府官員交換心得，並獲肯定。

二、早期我國參考歐美先進國家之廢棄物管理原則如污染者付費原則(Polluter pay principal)、延長生產者責任制(Extended producer responsibility)，及目前正在討論中的永續物質管理(Sustainable material management)等，推動多年的經驗發現，各原則下之實施方式，社會文化、飲食習慣、或地理環境等均爲重要的影響因素，各地區或各國可能要有自己的作法才比較容易成功，與會者包括了近四百名來自超過有三十多個亞洲、非洲和歐美等國家地區的專業人員，經由各種型式的討論，更可顯現前述論點。

三、而各國若要思考如何提高回收成效，在前述原則的大方向下，則要從本身的垃圾收集及清運體系中考量在哪個環節可以施以經濟誘因或法令強制規定，比較有效。如我國所採行的特殊作法，配合隨袋徵收及垃圾強制分類推行至全國的”垃圾不落地”措施，垃圾分三類的分類及收集體系、廚餘資源回收體系等，其他國家可能不容易採行。

四、相較於香港、中國大陸及其他東南亞國家，我國可說是早於 20 年前即開始推動，否則亦會面臨如香港目前的難題。由於生活習慣、文化較爲接近，可以互相觀摩學習彼此的推動經驗，過去我國的推動措施包括生產者責任制、資源回收四合一計畫、垃圾費隨袋徵收、垃圾不落地及焚化爐的興建過程等，其均樂於了解。

五、由於澳門及香港均有主管廢棄物管理的高階主管參與本次研討會，其中曾與香港環境保護署助理副署長、廢棄物管理首席主任及相關同仁，及與澳門民政署副主任委員、環境衛生處處長及相關同仁，另行安排其他時間以深

入交換我國過去實施經驗。故由會議中與來自政府單位的代表互動中可了解，可以垃圾減量資源回收與亞洲國家進行國際交流。

六、會議結束後即接獲新加坡、菲律賓及香港與會人員希望來台灣參訪或至其國家演講或來台採訪的來信，分別爲香港環境保護署委託專業公司於本年 6 月 13 日至 16 日來我國拍攝廢電子電器廢棄物的資源回收流程；及香港環保團體綠領行動組成訪問團預定於本年 8 月來本署拜訪源頭減量及資源回收(如附件五)，及菲律賓與會代表表示考量邀請我國代表至該國舉行的研討會進行垃圾資源回收的報告(如附件五)。研討會的共同參與已促成未來進一步的交流。

七、此次研討會亦有德國官方代表參加，故可聆聽目前歐盟對資源循環利用的最新的發展趨勢，包括歐盟 2008 年最新的「廢棄物架構指令」(the Waste Framework Directive , WFD, 2008/98/EC)，以及德國循環經濟在未來會與資源效率(resource efficiency)、回收稀有金屬(recycling of critical raw materials)、城市礦山(urban mining)及減少温室氣體排放(reduction of greenhouse emissions)等幾個議題相連結，以上均值得我們再密切注意。

八、各國回收率的計算方法不同故難以比較，香港 2010 年的回收率爲 49%，惟因定義不同,實難以比較。

International Conference on Solid Waste 2011
Moving Towards Sustainable Resource Management

Conference Information Pack

(16/04/2011)

Conference Theme

Growing solid waste problems and depletion of natural resources are the emerging challenges to the social, economic and environmental development worldwide. Waste management stands at the cross-roads in the material organization of society, resource management, changing lifestyles and consumption patterns, and ecological issues. The aim of the conference is to bring together various stakeholders from academia, industries, government and non-government organizations at international level to deliberate on issues pertaining to solid waste management, so as to share experience and have a better understanding of the policy needs, technical and scientific inputs, financial requirements and social changes required for sustainable resource management in the contemporary world.

Conference Venue

The Conference is hosted by the Sino-Forest Applied Research Centre for Pearl River Delta Environment, Hong Kong Baptist Univerisity, Hong Kong SAR, P.R. China. The conference will be held at the Hong Kong Convention and Exhibition Centre (HKCEC) (1 Expo Drive, Wan Chai, Hong Kong SAR, P.R. China) from 3-5 May 2011 in Wanchai. HKCEC is the second largest multi purpose-built centre in Asia and located at the Centre of an extensive and convenient transport network. The Conference will take place on the 4/F of HKCEC, the conference secretariat and reception counter will be located at the Foyer in front of room S421,

Bad Weather and Typhoons Policy

If a Typhoon Signal Number 8 or Black Storm hoisted before 08:00, conference venue will be temporarily closed. If a Typhoon or Rain Storm lowered or cancelled before 13:00, conference venue will be reopened in 2 hours. If a Typhoon or Rain Storm lowered or cancelled after 13:00, conference venue will be closed for the day.

Local Transportation

Train: You may take **Airport Express** to the Hong Kong Station, and then change to the Island Line of **MTR** (Metro / Subway) to Wan Chai Station. A single journey costs HKD100 and round trip is HKD180. It takes about 24 minutes.

Bus: You may also go to the Wan Chai District by **Airbus Bus** No. A11.

Taxi: Taxis are plentiful throughout Hong Kong apart from remote areas, and can be hailed on the street (except restricted areas) or summoned by phone. All are metered, relatively cheap, air-conditioned and clean.

Conference Structure

The Conference includes:

- **Pre-conference Workshop**
  - **'Biological treatments - composting and anaerobic digestion'** on 2nd May held in the Harbourview Hotel, 4 Harbour Road, Wanchai, Hong Kong,
- **Conference Reception**: 7:00 pm 2nd May in the Harbourview Hotel, 4 Harbour Road, Wanchai, Hong Kong
- **Main Conference**: from 3rd to 5th May in Hong Kong Convention and Exhibition Centre

(HKCEC), includes,
- Parallel oral sessions
- Poster presentation and viewing session
- Parallel exhibitions

- **Technical Field Trips**: Optional half day and full day (includes lunch) technical field trips on 6th May

Parallel Oral Sessions

The conference is structured into 4 parallel oral sessions in Lecture room S421, S425, S427 and S428. Each presentation will last for 20 minutes, including 5 minutes for questions. All will be presented in a strict ime schedule, in order to allow participants to move between the sessions. The chair-persons have the responsibility to ensure that the presentation schedule is strictly followed.

ALL SPEAKERS PLEASE SEND YOUR POWERPOINT AND A BRIEF BIOGRAPHY OF 50 WORDS BEFORE 29/4/2011 TO THE SECRETARIAT.

Poster Presentation and Viewing Sessions

A continuous poster presentation will take place in S423 and S424 and it will be open for all the 3 days. Special Poster viewing sessions are dedicated after lunch time for the 3 days (3 May: 1345-1410; 4 -5 May: 1345-1400). Participants are invited to view posters and exchange views and ideas with the authors who are suggested to be available in front of their posters during the viewing sessions.

Poster can be set up on 3rd May at 8 am and should be dismantled on 5th May at 6 pm.

Parallel Exhibition

The conference includes a parallel exhibition, which would provide companies and organizations with a unique opportunity to gain prominent visibility among internationally renowned and influential stakeholders in the area of waste management who are committed to achieve sustainable waste and resource management. Do take this chance to widen your network with companies which make conscious efforts providing cutting-edge technology, products and services in the marketplace.

Exhibition booths will be located in S423 and S424, and this special exhibition is open to the general public also.

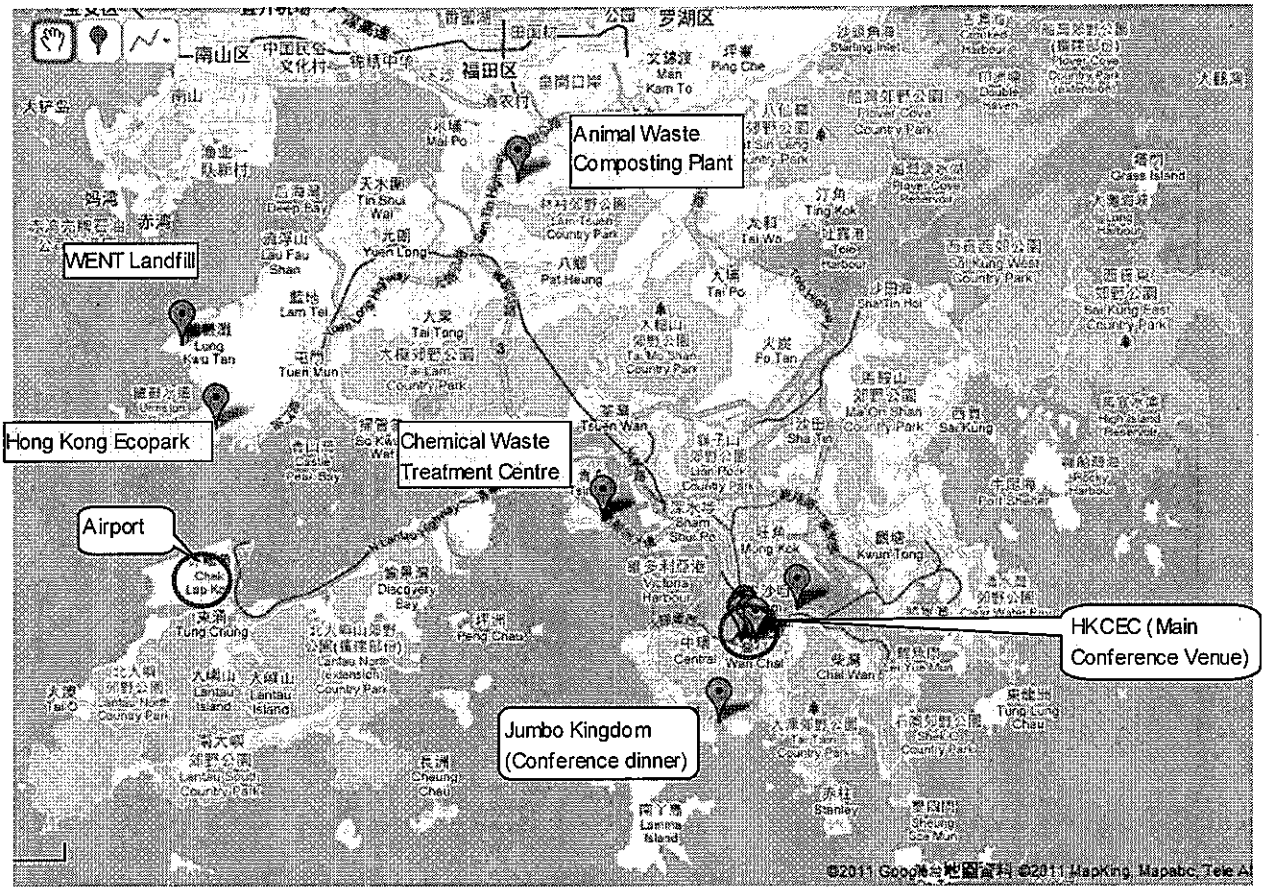
Opening Hours of Exhibition:
- 3 May 2011: 10:00 – 18:00
- 4 May 2011: 09:00 – 18:30
- 5 May 2011: 09:00 – 18:00

Coffee, Lunch and Conference Dinner

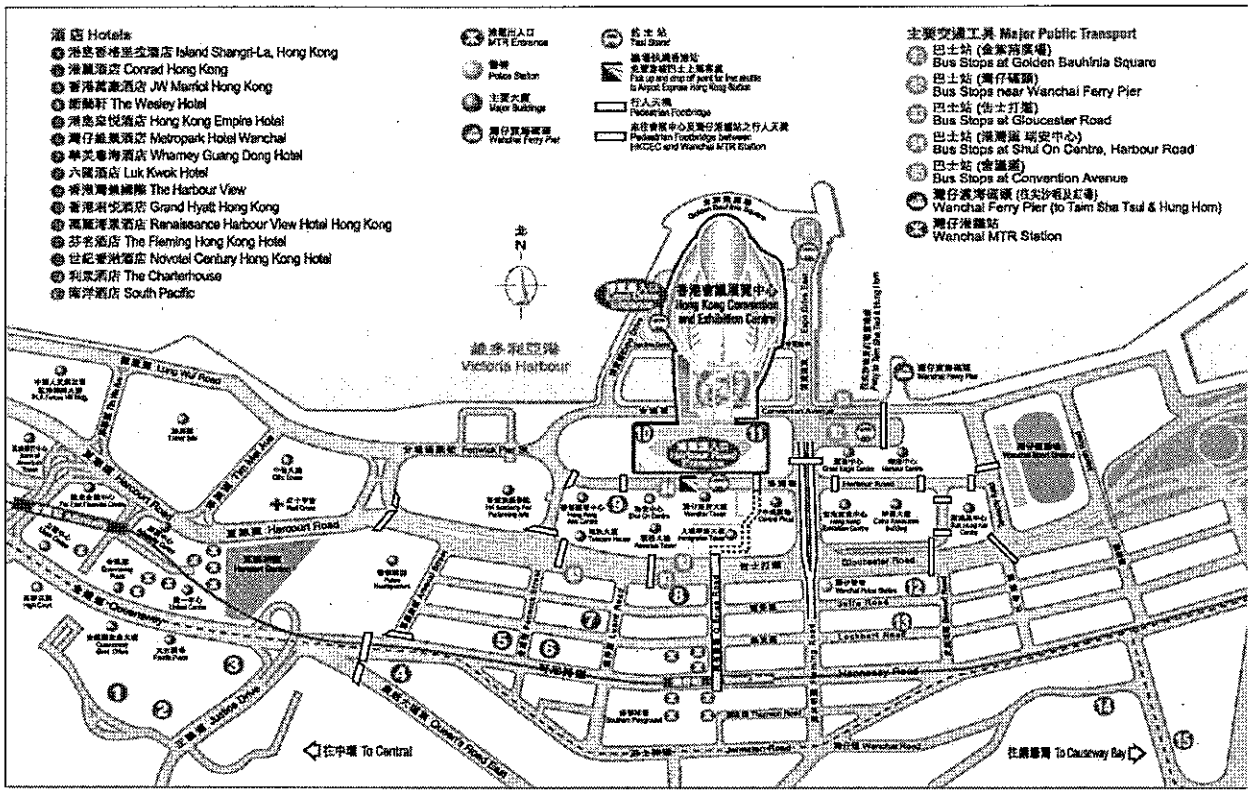
Coffee, tea, and light refreshment are included in the conference fee and will be served at the Foyer of S421 during breaks. Lunches are NOT included; there are plenty of choices for restaurants, fast food shops as shown in the leafleat inserted. If you are looking for Halal food, please obtain a list of restaurants at the reception counter.

The 'GCL-Poly' conference dinner will take place in Jumbo Kingdom in Shum Wan Pier Drive, Wong Chuk Hang, Aberdeen, (http://www.jumbo.com.hk/eng/main.php), southern part of Hong Kong Island, on 3rd May. Free shuttle bus will pick you up from the conference venue to the restaurant at around 6 pm, and back to Wanchai after the dinner around 10 pm. Please pay special attention to the announcement of the secretariat for the exact time and location (at the Harbour Road entrance of HKCEC) for this pick-up service.

✧ Regional Map of Hong Kong



✧ Map of Wan Chai (Facilities and Major Public Transport near the conference venue)



Instructions for Oral Presentations

Platform schedule

The platform sessions will be conducted from 3rd May morning through 5th May afternoon. The programme states the session to which your paper has been assigned and the day the session is scheduled.

Plan your presentation

Each presentation is scheduled for 20 minutes (15 minutes for presentation and 5 minutes for questions and discussion). If the audience has additional questions they will be asked to discuss their questions with the presenter after the session. No extension of the time set for presentation can be accepted. In fact, as there will be 4 parallel sessions, participants may have the possibilities to go between parallel sessions.

Upload your presentation

Please bring your presentation file to the Speakers Preparation Room (S426), the day prior to your presentation (for morning session for the next day), or during the lunch break (for the afternoon session). Presenters should be present at the session 10 minutes earlier to meet the session chair and check their presentations in the computer.

- ✧ Each room is equipped with a PC (Window OS), a video projector and a laser pointer.
- ✧ Please bring your presentation file on a CD or a USB flash memory stick.
- ✧ Please prepare your files in .ppt format using Microsoft Office PowerPoint 2003. If prepared using higher versions, enable to open the file in the compatibility mode.
- ✧ Please check before the session starts that your presentation works. (Note: No modems or internet connections will be provided in the sessions rooms).

Instructions for Poster Presentations

Display Area

- ✧ All posters should be prepared in an A0 "portrait" (width = 841 mm x height = 1189 mm) format. Your poster should have 25 mm margins around.

Set-up

- ✧ Posters will have dedicated sessions during the conference, during which authors must be next to their poster to answer questions.
- ✧ Please set up your poster 30 minutes before the opening session of the first day.
- ✧ Please remove your poster at the end of the closing of the conference.

THERE WILL BE A POSTER COMPETITION TO SELECT THE BEST PRESENTED POSTER FOR THE CONFERENCE. THE RESULTS WILL BE ANNOUNCED AND THE AWARDS WILL BE PRESENTED TO THE WINNERS DURING THE CLOSING SESSION.

Technical Field trips

Full-day Technical Visit 6 MAY 2011 (Fri) 08:30 – 17:30

08:30	**Depart from Wan Chai**
09:00 – 10:15	**Chemical Waste Treatment Centre (CWTC) at Tsing Yi**
10:45 – 12:00	**Animal Waste Composting Plant at Ngau Tam Mei**
12:15 – 13:15	**Lunch at Yuen Long**
13:45 – 15:00	**WENT Landfill**
15:30 – 17:15	**Hong Kong EcoPark,** Management and Tourist Centre Tenant 1: Champway Technology Ltd Tenant 2: Yan Oi Tong EcoPark Plastic Recycling Centre
17:30	**Return to Wan Chai**

Half-day Technical Visit 6 MAY 2011 (Fri) 08:30 – 12:45

08:30	**Depart from Wan Chai**
09:15 – 10:15	**Animal Waste Composting Plant at Ngau Tam Mei**
11:15 – 12:30	**Hong Kong EcoPark,** Management and Tourist Centre Tenant 1: Yan Oi Tong EcoPark Plastic Recycling Centre
12:45	**Return to Wan Chai**

Safety Notes from Chemical Waste Treatment Centre (CWTC) at Tsing Yi

When hearing fire alarm or evacuation announcement, you should:

1. Not panic
2. Follow the tour leader's instruction
3. Should NOT go back to training room to collect personal belonging
4. **No body is allowed to USE THE LIFTS for evacuation**
5. Gather at the fire assembly point, queue up and wait for head counts

During site visit, the following rules must be followed:

1. Follow the tour leader's instruction anytime
2. Wear safety helmet & safety spectacle anytime
3. Don't touch any containers, switches, machines or equipment
4. Don't leave the tour route
5. Don't run
6. NO photo taking

As part of the Company's industrial safety policy, visitors to our plant must age 16 or above. **They are requested to wear long sleeve shirt, long trousers, and proper shoes (no sandals, no slipper-type shoes please).** Participants who do not meet the above requirements will be asked to refrain from the plant area for safety reasons.

Help and Assistance

The Secretariat help desk will be open during the conference period at the foyer in front of S421 and also in S426. For special service, you can refer to the following members of the Secretariat Team.

Oral Presentation Program: Prof. Jonathan Wong and Dr A. Selvam

Poster Presentation Program: Dr. A Selvam and Ms. Zoie Wong

Conference Secretariat: Ms. Derry Chow and Ms. Aila Xu

Conference Reimbursement and Refund: Ms. Derry Chow and Ms Tina Mak

Contact Us

Website: http://arcpe.hkbu.edu.hk/conf2011/

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Telephone: 852 3411 2537

Main Conference Programme

2 May 2011 (Monday)

Reception: 2 May 2011 (Mon) 1900 – 2030 (The Harbourview Hotel)

3 May 2011 (Tuesday)

Registration: 3 May 2011 (Tue) 0800-0900

Opening Ceremony: 3 May 2011 (Tue) 0900-0935

Welcome address: Prof. R.W.K. Wong, Vice President (R&D), Hong Kong Baptist University, Hong Kong SAR, P.R. China

Opening Speech: Dr. Kitty Poon, Under Secretary, Bureau of Environment, Hong Kong SAR, P.R. China

Opening Keynote Speech: 3 May 2011 (Tue) 0935- 1005 Chair: Prof. J.W.C. Wong

Circular Economy in the European Union and in Germany: Contribution to Resource Efficiency and Climate Protection, Dr. H. Wendenburg, Federal Ministry for the Environment, BMU (Germany)

Coffee Break: 3 May 2011 (Tue) 1005- 1035

Keynote Speech: 3 May 2011 (Tue) 1040 – 1140 Chair: Prof. A. Bockreis

Energy Balance of Biowaste Compost Used as Organic Fertilizer in Farming, Prof. W. Bidlingmaier, BAUHAUS-University Weimar (Germany)

Sustainable Solid Waste Management: Fate of Emerging Contaminants, Prof. R.Y. Surampalli, USEPA (USA)

Section A	Section B	Section C	Section D
3 May 2011 (Tue) 1145 – 1245			
Countries' Perspectives	**Anaerobic Digestion**	**Landfill Management**	**Waste Recycling for Construction**
Chair: R.D. Tyagi	*Chair: K. Fricke*	*Chair: R. Goldstein*	*Chair: K.R. Reddy*
Status and Policy of MSW Reduction and Recycling in Taiwan, YY Lai / Taiwan	**State of The Art of Anaerobic Digestion of Municipal Solid Waste in Europe,** L De Baere / Belgium	**Recoverable Waste and Resources in Old Landfills,** A Bockreis / Austria	**Recycling of Glass Derived from Cathode Ray Tubes as Fine Aggregates in Cement Mortar,** CS Poon / Hong Kong SAR
Waste Reduction and Recycling in Hong Kong, LTK Wong / Hong Kong	**Performance of a Commercial-Scale DiCOM™ Demonstration Facility Treating Mixed Municipal Solid**	**Restoration and Aftercare of Closed Landfills in Hong Kong,** JKF Ng/	**The Microstructural Study of Cullet-Clay Brick from Recycle**

SAR **U.S. Solid Waste Planning Experience and Insights for Rapidly Advancing Nations,** M Chowdhury / USA	**Waste,** L Walker / Australia **Development of a Column Bioreactor Technology (CBT) for Anaerobic Digestion (AD) of Organic Substrates: Food Waste,** S Y Bodkhe / India	Hong Kong SAR **Enrichment of Aerobic and Anaerobic Ammonium Oxidising Bacteria from Municipal Solid Waste and Leachate,** S Sri Shalini / India	**Glass,** Md R Sahar / Malaysia **Approaches for Construction and Demolition Waste Management in Hong Kong,** A R Chini / USA

Lunch: 3 May 2011 (Tue) 1245-1345

Poster Viewing: 3 May 2011 (Tue) 1345-1410

Keynote Speech: 3 May 2011 (Tue) 1410-1510 Chair: Prof. W. Bidlingmaier

Recycling of Packaging Waste and Other Recyclables – A Contribution to Resource Productivity, Mr. T. Schmid-Unterseh, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany)

Energy Efficiency of Substance and Energy Recovery of Selected Waste Fractions, Prof. K. Fricke, Waste Management Department of Leichtweiß-Institute at Technical University of Braunschweig (Germany)

Section A	Section B	Section C	Section D
3 May 2011 (Tue) 1515-1615			
Countries' Perspectives ***Chair: J.G. Paul***	**Anaerobic Digestion** ***Chair: R.Y. Surampalli***	**Landfill Management** ***Chair: A. Bockreis***	**Waste Recycling for Construction** ***Chair: C.C. Wu***
Recycling: A View on Developing Technologies, A Jallet / Hong Kong SAR **Sustainable Solid Waste Management Approach in Kathmandu: Possibilities and Challenges,** DR Pathak / Nepal **Developing Integrated Wastes Management Plan in Sudan,** TEB Abdalla / Sudan	**Effect of Ferrous Sulphate on Biomethanation and Acceleration of Biogas Production from Organic Fraction of Municipal Solid Waste,** MK Mondal / India **The Intermediate Aerobic Hydrolysis: A New Way to Improve the Biogas Yield?** T Thiel / Germany **Changes of Methanogenesis Pathways during the Initiation of Thermophilic Anaerobic Digestion**	**Effectiveness of Drainage Blanket for Leachate Recirculation in Heterogeneous and Anisotropic Municipal Solid Waste,** KR Reddy / USA **Degradability by Anaerobic Digestion of Landfill Leachate at Benowo in Surabaya, Indonesia,** M Kawai / Japan **Biodegradation of Organics in Landfill Leachate by Immobilized White Rot Fungus, *Trametes Versicolor* BCC 8725,** S Babel /	**Some Properties of Cement-copper Tailings Mortars,** O Onuaguluchi / Turkey **Minimizing On-site Construction Waste through Prefabrication in Hong Kong,** HP Yuan / Hong Kong SAR **Beneficial Use of Oyster Shells Powders in Concrete: Influence on the Mechanical Strength**

	from Acid Crisis, LP Hao / PR China	Thailand	**properties**, F Becquart / France

Coffee Break: 3 May 2011 (Tue) 1615 - 1635

3 May 2011 (Tue) 1635-1735

Waste Management	Anaerobic Digestion	Landfill Management	Special Waste Treatment
Chair: M. Chowdhury	*Chair: W. Bidlingmaier*	*Chair: C. Visvanathan*	*Chair: R. Tsang*
Implementing Regional Ecology Centers in the Visayas Region, Philippines: Networking to Enhance Sector Development and Solid Waste Management, JG Paul / Philippines	**German GHG Mitigation Lighthouse Project MBT Plant Gaobeidian (PR China)**, M Ginter / Germany	**Developing Tools and Resources that Promote Energy Recovery from Landfills**, R Goldstein / USA	**Effects of Alum Sludge Characteristics on the Efficiency of Coagulants Recovery by Acidification**, CC Wu / Taiwan
Application of Multi-Criteria Analysis in Management of Municipal Waste in Chosen Region in Poland, Z Kowalski / Poland	**Food Waste Hydrolysis in SLS-CSTR Under Low Organic Loading Rate: Effect of pH and Metabolite Distribution**, O P Karthikeyan / Hong Kong SAR	**Process for Upgrading Landfill Gas to Produce CNG in Beijing**, H Zhou / PR China	**Molecular Sieves from Waste Cathode-Ray-Tubes (CRTs)**, D Pant / India
Pro- Poor Carbon Financing through KIPRAH Community-based Waste Management in Indonesia, J Kusumowati /Indonesia	**Effect of Inoculum to Substrate Ratio on the Decomposition of Food Waste in the Hydrolytic-Acidogenic Leach Bed Reactor.** SY Xu / Hong Kong SAR	**Methane Oxidation in Stabilized Waste Matrix at Municipal Solid Waste Dumpsite**, C Chiemchaisri / Thailand	**The Behavior of Tetracyclines and Cu during the Anaerobic Digestion of Swine Manure**, X Wu / PR China

Get-Poly Conference Dinner: 3 May 2011 (Tue) 1900 - 2200

Wednesday, May 4, 2011

Keynote Speech: 4 May 2011 (Wed) 0900 – 1000 Chair: Prof. K. Fricke

Financing of Waste Management - Various Options to Cover Operational Costs, Dr. H. Koller, the International Solid Waste Association (Austria)

Health Risk Assessment of PCDD/F Emissions from Municipal Solid Waste Incinerators (MSWIs) in China, Prof. J. Yan, Zhejiang University (P.R. China)

Section A	Section B	Section C	Section D

4 May 2011 (Wed) 1005 – 1105

Waste Management

Chair: W. Charles

The Comprehensive Treatment Pattern of Municipal Solid Wastes Based on Category Classification of Beijing, HY Zhang / PR China

Web-based Decision Support System for Economic Evaluation of Municipal Solid Waste Management, J Kulczycka / Poland

Integrated Waste Management in Urban Areas Using Geographic Information System (GIS), M Govindaraju / India

Anaerobic Digestion

Chair: M. Ginter

Anaerobic Digestion of Organic Waste – Experience with Different Systems, H. Marliere / Poland

Biogas Production from Crop Stalks through Anaerobic Digestion in China - from Research to Demonstration, XJ Li / PR China

Optimization of the Operational Parameters of a Mesophilic Two-Phase Anaerobic Digester for Vegetable Waste Degradation, BN Zhu / PR China

Thermal Technology

Chair: J. Yan

Status and Perspectives of Waste Incineration in China, M Nelles / Germany

An Experience Sharing from Japan - Advanced Waste-to-Energy Technology for Clean Environment, H Fukai / Japan

International Waste Management Practices and MSW Thermal Treatment Technologies, KCK Lai / Hong Kong SAR

Sludge Management

Chair: J.Y. Wang

Electroosmotic Flows in Sludge at Dewatering, DJ Lee / Taiwan

An Innovative Technique to Decontaminate Activated Sludge Increasing Anaerobic Digestion Performance, G Mininni / Italy

The Dewatering and Recycling of Municipal Sewage Sludge Facilitated by Bioleaching: A Case Study, L Zhou / PR China

Coffee Break: 4 May 2011 (Wed) 1105-1125

4 May 2011 (Wed) 1125-1245

Waste Management

Chair: Z. Kowalski

A Decentralization-based Approach to Urban Waste Management: Moving Towards Sustainable Resource Management, JY Wang / Singapore

Supporting Innovation in Waste Management - The SITA Blue Orange Approach, J Boelen / Hong Kong SAR

Organic Waste Management

Chair: J. Doublet

Considerations for Selecting Organic Waste Management Options, J Nair / Australia

Zero Waste Processes Using Biological Treatment – Examples From Several Plants In Germany, G Rettenberger / Germany

Thermal Technology

Chair: M. Nelles

Hydrothermal Treatment of Incineration Fly Ash: the Effect of Iron Oxides, D Chen / PR China

Thermal Treatment for Biosolids - Another Breakthrough? KWR Tsang / USA

Sludge Management

Chair: D.J. Lee

In-vessel Co-composting of Sewage Sludge with Horse Stable Bedding Waste, A Selvam / Hong Kong SAR

Efficiencies and Heat Balance of Pilot-Scale Two-Phase Anaerobic Digestion of Waste Activated Sludge from A/O Process, LG Zhang / PR China

An Approach Towards the Integrated Electronic Waste (E-Waste) Management Technique in Malaysia, O Norazli/ Malaysia	**A Multi Criteria Approach for Enhancing the Energy Efficiency of Treatment Facilities for Organic Residues - First Results and Consequences**, T Bahr / Germany	**Production of Glass-ceramics Obtained from Sewage Sludge Residue by Microwave Melting Method**, D Chen / PR China	**Phyto-treatment of Sewage Sludge and Recycling Sludge Leachate in Agriculture**, QT Wu / PR China
Environmental Risk Related to Specific Processes of Scrap Computers Recycling and Disposal, J Li / PR China	**MBT as A Strategically Project for the Social and Environmental Development**, C Pereira / Brazil	**Phase Transformation of Metals in Reusing the Incineration Ash of Chemically Enhanced Primary Treatment Sludge as Ceramic Raw Materials**, K Shih / Hong Kong SAR	**Non Sewage Pipe Toilet System - A Sharing on MBR Biotoilet Water Recycling Experiences in Hong Kong**, DM Cheng / Hong Kong SAR

Lunch: 4 May 2011 (Wed) 1245-1345

Poster Viewing: 4 May 2011 (Wed) 1345-1400

Keynote Speech: 4 May 2011 (Wed) 1400-1500 Chair: C. Visvanathan

Strategies for the Management of Solid Waste in Developing Countrie, Dr. L. Diaz, Calrecovery (USA)

Food waste Composting in Hong Kong: Opportunities and Challenges, Prof. J.W.C. Wong, Hong Kong Baptist University (Hong Kong SAR, P.R. China)

Section A	Section B	Section C	Section D
4 May 2011 (Wed) 1505-1605			
Waste Management	Composting	Thermal Technology	Education and Awareness
Chair: A. Vogel	*Chair: J. Li*	*Chair: L. Diaz*	*Chair: J.W.C. Wong*
Biogas and Material recycling to substitute Municipal Waste Landfills in P.R.China, B Raninger / Germany	**Development of an Efficient and Robust MBT Process Suitable for Newly Industrialized Countries - First Results of a Pilot Plant Operated in Thailand**, S Platz/ Germany	**Evaluation on Efficiency of Energy Yield in Catalytic Gasification of Paper-Reject Derived Fuel**, KY Chiang / Taiwan	**Survey and Analysis of Knowledge, Attitude, and Behaviour in Waste Management of the General Public in Taiwan**, SC Yeh / Taiwan
Co-Digestion of Tannery Solid Waste- Carbon Trading Opportunities in Leather Sector, K Sri Bala Kameswari /India	**Production of High Environmental Quality Composts Made with Biodegradable Solid Waste**, J Doublet / France	**A Life Cycle Evaluation of Woody Biomass Gasification for District Heating in British Columbia**, A Pa / Canada	**The Public Endorsement of the Domestic Solid Waste Levy Scheme: Citizen's Perception in Hong Kong**, KK Wong / Hong Kong SAR

Co-Composting of Palm Oil Mill Waste and Waste Water – A Powerful Process to Reduce Green House Gas Emissions, F Schuchardt / Germany

Role of Biodegradable Plastics in Waste Management, M Caggiano / Italy

Characterization of Steam Exploded Softwood Pellets, AK Lau / Canada

Capacity Building at Local Government Level to Turn Waste into a Resource, MA Memon / Japan

Coffee Break: 4 May 2011 (Wed) 1605-1625

4 May 2011 (Wed) 1625-1725

Waste Recycling Policy

Chair: F.S. Sit

The Informal Recycling Market in Ormoc City, Philippines: Evaluation of Options to enhance Resources Recovery and to reduce GHG Emissions, K Hetz / Philippines

Modern Refuse Collection Concepts as a Challenge for More Sustainability, A Vogel / Germany

Do Economic Incentives Affect Attitudes to Solid Waste Source Separation: Evidence from Ghana? V Owusu / Ghana

Composting

Chair: L. Walker

Effects of Aeration on the Rapid Composting Process and Enzymatic Activities in a Lab-sized Bioreactor, J Li / PR China

Changes in Mobility of As, Cr and Ni During Composting of Household Bio-waste, A Hanc / Czech

The Effect of Turning and Covering on Greenhouse Gas and Ammonia Emission from Composting of Pig Faeces, GX Li / PR China

Thermal Technology

Chair: K.Y. Chiang

Predicting the Heating Value of Wood Biomass Using NIRS (Near InfraRed Spectroscopy), J Doublet / France

Can Hong Kong Learn Anything from the Experiences of Pearl River Delta in Producing Electricity from Waste? V F S Sit / Hong Kong SAR

Testing of Briquette Production for Household Use by the Informal Waste Workers at the Calajunan Dumpsite in Iloilo City, Philippines, ARD Romallosa / Philippines

Education and Awareness

Chair: K.K. Wong

Environmental Education at Primary Schools in Iloilo City, Philippines and Options to Enhance Value Formation for Solid Waste Management, JG Paul / Philippines

The Role of Environmental Education in Waste Separation Programme – Hengxian a Case Study, L Zhang / PR China

Bin Free City – Making it a Reality!, V Agrawal / India

Thursday, May 5, 2011

Keynote Speech: 5 May 2011 (Thu) 0900 – 1000 Chair: Prof. R.Y. Surampalli

Greenhouse Gas as Critical Considerations in the Sustainable Wastewater Biosolids Management, Prof. R. D. Tyagi, Institut National de la Recherche Scientifique (Canada)

Higher Education Needs for Solid Waste Management through 3R in Asian Developing Countries, Prof. C. Visvanathan, Asian Institute of Technology (Thailand)

Section A	Section B	Section C	Section D
5 May 2011 (Thu) 1005-1105			
Waste Recycling Policy	Composting	Thermal Technology	Workshop
Chair: S.C. Yeh	*Chair: A.K. Lau*	*Chair: K. Shih*	
Assessment of a Solid Waste Management System as a Case Study: Social Impacts on Former Waste Pickers in San Carlos City, Philippines, MA Quiroga / Bolivia	**Introduction of an Effective Faeces Composting System in the Ger Areas of Ulaanbaatar, Mongolia**, X Liu / PR China	**Experimental and Thermodynamic Investigation on Transfer of Zinc Influenced by Chlorine, Sulfur and Phosphor during Thermal Treatment of Sewage Sludge**, Y Li / PR China	
Implications of Recycling Activities on Sustainability of Solid Waste Management in Thailand, SNM Menikpura / Thailand	**Effects of Seeding on Performance of Household Organic Waste Composting Using Passive Aeration Bin**, S. Kamchanawong / Thailand	**Study Effects of Cement Replaced by Burned Joss Paper Ash**, HL Luo / Taiwan	
Some Experiences on Promoting Carbon Footprint Labels of Products, YW Cheng / Taiwan	**Management of Food Industry Waste Employing Vermicomposting Technology**, VK Garg / India	**Fuel Products from Catalytic Co-Gasification of Pulp Sludge Mixed with Black Liquor in Fixed Bed Reactor**, C Sirinawin / Thailand	
Coffee Break: 5 May 2011 (Thu) 1105-1125			
5 May 2011 (Thu) 1125-1245			
Waste Recycling in Developing Countries	Composting	Bioenergy	
Chair: B. Raninger	*Chair: J. Nair*	*Chair: R.D. Tyagi*	
Determination of the Potentiality of *Eisenia Foetida* to Degrade Disposable Paper Cup Waste - A Solution to Solid Waste Pollution, M Vasanthy / India	**The BiobiN - An Organic Solution too Good to Waste**, CJ Brideson / Australia	**Rotatable Bioelectrochemical Contactor for Energy-Efficient Treatment of Organic Wastestreams**, KY Cheng / Australia	
Solid Waste Recycling Strategies in Selected Municipalities of Southern Luzon Philippines, G Pangga /	**Sustainable Solutions for Waste Management via Roadside Gully Pot Cleansing**, KM Scott / UK	**Screening of Agro-Industrial Wastes for Fungal Bio-Production of Citric Acid and Optimization of Process**	

Philippines **Sustainable Waste Management in Malaysia: A Focus on 3R Related Policies**, S Chenayah / Malaysia **Scavenging in Landfill: Contributions to Sustainable Landfilling in Developing Countries?** C Meidiana / Austria	**Characterizing Waste Biostability by Scanning the Humification of Waste-Derived Chromophoric Dissolved Organic Matter**, F Lü / PR China **Turning Organic Waste into a Valuable Resource – A Practical Approach**, D Loh / Singapore	**Parameters through Response Surface Methodology**, GS Dhillon / Canada **The Effect of Seed Sludge Concentration and Pretreatment by Beads-Milling in Anaerobic Digestion of Microalgae Chlorella Vulgaris**, N Nagao / Malaysia **Analytical Challenges in Secondary Resources Processing: Thermogravimetry, Subsieve and XRD Constraints for a Composite Fines Sample**, IO Ogunniyi/ Nigeria	

Lunch: 5 May 2011 (Thu) 1245-1345

Poster Viewing: 5 May 2011 (Thu) 1345-1400

Keynote Speech: 5 May 2011 (Thu) 1400-1500 Chair: R.D. Tyagi

Biotechnological Interventions for Solid-waste Management: Utilization of Agro-industrial Residues for Developing A Green Bioprocess for the Production of Poly-3-hydroxybutyrate (PHB), Prof. A. Pandey, CSIR (India)

Can We Get High Value-added Bioorganic Fertilizers for Controlling Soil Born Pathogenic Disease from Organic Solid Wastes? Prof. Q. Shen, Nanjing Agricultural University (China)

Section A	Section B	Section C	Section D
5 May 2011 (Thu) 1505-1605			
Waste Recycling ***Chair: T. Bahr***	**Composting** ***Chair: Q. Shen***	**Bioenergy** ***Chair: A. Pandey***	**Public Workshop**
Cost Recovery Mechanism to enhance Solid Waste Management in Bayawan City, Philippines: Experiences and Potentials, JD Boorsma / Philippines **Ultrasound Techniques for Process**	**How An Interdisciplinary Research Centre Can Help to Better Understand and Mitigate the Challenge of Solid Waste Management – A Case Study of Urban Community Composting?** KM Lai / UK **Composting Sewage Sludge in**	**Sustainable Disposal of Green-waste (Banana leaf, Stem and Arecanut Husk) by Anaerobic Digestion for Recovery of Fibre, Biogas and Compost**, S Malayil / India **Utilization of Agricultural Residues**	**Waste Management For Property Managers** **(Local Participants)**

Control and Quantitative Measurement in Polyolefin Magnetic Density Separation, SA Sanaee / Netherlands	**China**, L Aldick / Germany	**with Newly Designed Biochar Reactor**, MY Mensah / Ghana	
Study of Calcined Heavy Oil Contaminated Clay Replacement on Properties of Mortar, HL Luo / Taiwan	**Practical Way to Turn Trash into Eco-fertilizer**, KSW Wong / Hong Kong SAR	**Combined Supercritical/ Subcritical Conversion of Biomass Waste for Ethanol Production by Using Batch and Flow Reaction System**, Y Zhao / PR China	

Coffee Break: 5 May 2011 (Thu) 1605-1625

5 May 2011 (Thu) 1625-1725

Waste Recycling *Chair: J. Kulczycka*	Biological Treatment *Chair: K.M. Lai*	Industrial Waste Treatment *Chair: A. Selvam*	Public Workshop
Secondary Lead Recycling from Lead-Acid Batteries: A Systematic Approach for Sustainable Management, B Lopez Nino / PR China.	**Suppression of Plant Pathogen (*Phytophthora Cinnamomi*) Growth and Colonisation by Compost and Leachate from Anaerobic Digestion of Organic Fraction of Municipal Solid Waste (OFMSW)**, W Charles / Australia	**The Recycling Techniques for Wastewater of Discard Compact Disc Recovery**, SS Ton / Taiwan	**Waste Management For Property Managers** **(Local Participants)**
Biodegradation Behaviour of Recycled Polyethylene/ Cellulose Microfiber from Cotton Fabric Waste Films in a Laboratory-Scale Composting Condition, C Pechyen/ Thailand	**From Cellulosic Biomass to Bioenergy—Pretreatment, Saccharification and Related Technologies**, F. Yujie/ P.R. China	**Co-deposition of Environmentally Hazardous Oil Shale Ash and Semicoke Waste Materials**, A Sedman / Estonia	
Biosurfactant Production Potential of New microbial Isolates using Combination of Distillery Waste with Other Industrial Wastes, KV Dubey / India	**The Toxicity and Biodegradation of LAS in a Vermifiltration System**, J Nair / Australia	**Design of Safe Disposal System for Mercury Bearing Brine Sludge from Chlor-Alkali Industry**, J K Bhattacharyya / India	

Closing: 5 May 2011 (Mon) 1735 – 1800 (S421)

Poster Programme

Poster Viewing Time	Special Viewing Time
All Day Open from 3 to 5 May	1330-1410, 3 May 1330-1400, 4 May 1330-1400, 5 May

	Waste Management
123	Establishment of City Eco-Waste Center at Barangay Green Valley Ormoc City, Leyte, Philippines - MG Fumar / Philippines
143	Evaluation of E-Waste Generation Potentials in Metro Cebu, Philippines - JG Paul / Philippines
164	Air Pollution from Municipal Solid Waste Transport: A Case Study of Trichy City,Tamil Nadu, India - SM Horaginamani / India
202	Evaluation of Green House Gas (GHG) Emissions from Municipal Solid Waste Management Applying a GHG Calculator in Ormoc City, Philippines - MG Fumar / Philippines
205	Implementing a Monitoring System for the Waste Management Center, Bayawan City, Philippines - JD Boorsma / Philippines
244	Pacific Regional Solid Waste Management Strategy: Its Applicability on South-East Asia Countries - BH Yuen / PR China
259	Monitoring Heavy Metal Pollution in Soils and Crops affected by Solid Waste Disposal in Vegetable Production Bases of Hong Kong and Macao - HD Ruan / PR China.
260	Source and Distribution of Pollutants in Water and Sediment Relating to Waste Discharge in Yak Chong River, Macao - HD Ruan / PR China
276	Interfacing the So-called Ingredients in SWM Environmental Governance Vis-à-vis Local Authorities and Communities in the Philippines - EP Crucio / Philippines
279	How to Develop an Effective and Safety Food Waste Source Separation and Collection Arrangement - WJ Deng / Hong Kong SAR
301	Inland Water Pollution in Bangladesh: The Need for Regulatory Reform - BK Saha / Australia
360	Carbon Emission and Ways of Carbon Reduction in Treatment System for Municipal Solid Waste - W Song / China
432	Non-probability Sampling - a Feasible Approach for Street Intercept Surveys in Hong Kong? - WKY Lau / Hong Kong SAR
500	A Comparative Review of Life Cycle Assessments in Municipal and Organic Waste Management - LY Woo / Hong Kong SAR

	Waste Recycling
113	Characteristics of Porous Ceramics Produced from Waste Diatomite and Water Purification Sludge - KL Lin / Taiwan
115	An Experimental School Prototype: Engaging Children's Senses in 3R (Reduce, Reuse & Recycle) Learning - SY Kong / Malaysia
152	Production and Properties of Forsterite-based Refractory from Iron Ore Tailings - J Li / PR China
178	Microstructure and Physical Properties of Ceramic-Based Incinerated Paper-Cullet-Clay - Md R Sahar / Malaysia

	Waste Recycling
228	Effect of Properties of Sintered Glass-Ceramics Fabricated From Solar Panel Waste Glass - KL Lin / Taiwan
257	Application of Modified Clay Mineral Waste Material for the Removal of Cadmium (II) in Water - HD Ruan / PR China
258	Effects of Ionic Strength and pH on Phosphate Adsorption by Modified Clay Mineral Waste Material - HD Ruan / PR China

292	Analysis of Substitution Effects of Recycling Products from Food Waste - HY Lin / Taiwan
362	Research on Waste Separation and Recycling in China - C Deng / PR China
409	Optimizing the Production of Pozzolana Using High Calorific Wastes - MY Mensah / Ghana
481	Impact of the Construction and Demolition Waste Charging Scheme on the Work Practices on Building Construction Sites in Hong Kong, CS Poon / Hong Kong SAR

Anaerobic Digestion	
006	25 Full-Scale Anaerobic Digestion Plants, Experiences And Opportunities - L De Baere / Belgium
190	Influence of the Food Waste Leachate on the Anaerobic Granulation Process in a UASB Reactor - Y Ezawa / Japan
306	Methane Production From Anaerobic Co-digestion of Pulp & Paper Sludge and Food Waste - Y Lin / PR China
395	Performance of Vegetable Wastes Anaerobic Digestion at Different Inoculums and Organic Loads - Y Liu / PR China
430	Anaerobic Co-Digestion of Vegetable Waste with Spent Yeast - B Primasari / Malaysia

Composting	
176	Co-composting of Kitchen Waste, Straw and Manure: A Study on the Effect of Mixing Ratios on Compost Maturity and Emissions - D Gao / PR China
242	Utilization of Bat Guano for Organic Farming in Hong Kong - CK Wan / Hong Kong SAR
283	In-vessel Co-composting of Horse Stable Bedding and Abattoir Blood Meal at Different C/N Ratios: Process Efficiency – A Selvam / Hong Kong SAR
307	Effect of Composting on Semivolatile Organic Chemicals (SVOCs) Removal from Sewage Sludge - Q Cai / PR China
434	The Fates of Sulfadiazine, Chlorotetracycline, Ciprofloxacin during Composting of Swine Manure - ZY Zhao / Hong Kong SAR
440	Effects of Different Composting Techniques on Nitrogen Transformation and Nitrogen Loss during Composting - X Wang / PR China

Landfill Management	
144	Climate Mitigation with Appropriate Soil Cover on Landfills: Experiences from Various Case Studies within the Visayas Region, Philippines - JG Paul / Philippines
255	Landfill Site Selection for Municipal Solid Waste Disposal Using Remote Sensing and GIS Technique for Bhopal City, M.P., India - DK Tripathi / India
328	Waste Stabilization and Pollution Reduction in Semi-aerobic Landfill Operated under Natural Ventilation - C Chiemchaisri / Thailand
436	Mitigation of GHG Emissions through Semi-Aerobic Landfill Method - K. Wangyao/ Thailand
667	Unfolding an Open Dump under Water Using GIS Tool in Mandaue City, Cebu - EP Crucio / Philippines

Thermal Technology	
182	Air Gasification of Cassava Rhizome in Fixed Bed Gasifier - P Somkade / Thailand
183	Steam Reforming of Tar Model Compound Using Pd Catalyst on Alumina Tube - J Nisamaneenate / Thailand
185	Pyrolysis and Gasification of Plastic Wastes from Landfill with Ni–Mg–Al Catalyst - P Kaewpengkrow /Thailand
207	Catalytic Decomposition of Biomass Fuel Gas over $La_{1-x}Ce_xCoO_3$ With Toluene as Model Compound - K Soongprasit / Thailand
229	Plasmatron Pyrolysis of Municipal Solid Waste from Steam Mechanical Heat Treatment for Bioenergy Production - JL Shie / Taiwan
337	Study on Combined Sewage Sludge Pyrolysis and Gasification Process: Product Choice and Mass & Heat Distribution - Z Wang/ PR China
357	Producing Bio-char from Sewage Sludge Pyrolysis and Applying the Bio-char for Enhancing Plant Cultivation - X Song / PR China
415	Dry Matter Losses and Gaseous Emissions During Storage and Biodrying of Woody Biomass - X He / Canada

Bioenergy	
180	Catalytic Hydrogen Production from Glycerol Using Palladium Supported on Alumina Tube - A Jiewkok / Thailand
186	Fuel Gases Production from Gasification of Black Liquor mixed with Eucalyptus Bark using Fixed Bed Reactor - W Kripittayakorn / Thailand
358	Converting Agricultural Biomass Wastes into Cellulosic Ethanol by Fermentation – C H Yu / PR China
523	Surface-active Properties of Novel Biosurfactants at Extremes of Environmental Conditions useful in Remediation of Pesticides Contaminated Soils - KV Dubey / India
524	Curd Whey as Total Replacement to Synthetic Medium in Development of Technique for Screening and Isolation of Enhanced Biosurfactant Producing Mutants of *Pseudomonas Aeruginosa* Strain -PP2 - KV Dubey / India
608	Identification of Conversion Reaction By-products of Biomass to Bio-fuels by Simultaneous Determination of Levulinic acid, γ-Valerolactone, 1,4 – Pentanediol and 5-HMF employing GC-MS with special column DB-WAX – GJ Zheng / Hong Kong SAR

Special Waste Treatment	
159	Disposal of Pesticides Including DDT in a Chinese Cement Plant as a Blueprint for Future Environmentally Sound Co-processing of Hazardous Waste Including POPs in the Chinese Cement Industry - G Maurer / PR China
226	Potential Applications of the Solid Wastes Generated During Jatropha Biodiesel Production – CH Yu / PR China
265	The Role of *Galactomyces* sp. Z3 in Improving Pig Slurry Bioleaching - J Zhou / PR China
329	Remediation of Heavy Metals from Contaminated Sediments using Electrocoagulation processes - K Lokkumlue / Thailand
331	Influence of Environmental Factors on Movement of Heavy Metals Contaminated Sediment - A Jongwisuttisun /Thailand
378	Leachability of Antimony from Mine Tailings around an Antimony Mine, China - MC He / PR China
406	The Bio-oxidation of Energy Substances Accelerated by Interaction of *A. thiooxidans* and *A. ferrooxidans* during Sewage Sludge Bioleaching and the Optimum pH Value for Dehydration of Bioleached Sludge – F Liu / PR China
611	Biodegradation of OPnEO: Potential Endocrine Disruptors from Tannery Sewage – BH Yan / Hong Kong SAR
613	Fate of Antibiotic Resistance Genes and the Changes in Bacterial Diversity during Composting of Swine Manure – D Xu / Hong Kong SAR
614	Microemulsions Enhance the Bioremediation of Lindane (γ-hexachlorocyclohexane) Contaminated Soils via the Inoculation of *Sphingobium Indicum* – GY Zheng / Hong Kong SAR

Sludge Management	
239	Incinerability Tests on Different Kinds of Sewage Sludge - G Mininni / Italy
240	Utilization of Sludge Waste from Natural Rubber Manufacturing Process as a Raw Material for Clay-ceramic Production - P Thavorniti / Thailand

Workshop on Waste Management for Property Managers

Co-organisers:
Sino-Forest Applied Research Centre for Pearl River Delta Environment, Hong Kong Baptist University
Environmental Protection Department
Hong Kong Association of Property Management Companies

Date: 5 May 2011

Time: 14:00 to 17:00

Venue: Hong Kong Convention and Exhibition Centre

Fee: Free registration, limited to 100 participants

The aim of the Workshop is to promote sustainable waste management in the property management sector.

Reducing waste generation is of high priority in the Government's waste management agenda since our available landfill space is going to run out in 4 to 8 years' time. Currently, household waste recovery and reuse in Hong Kong is about 35% which is well below that of the commercial and industrial sectors. How to encourage public participation in waste separation program to reduce waste generation and to increase waste recovery will be the most critical factor determining the success of our waste management strategy. For this reason, the property management will play a key role in taking up the challenge to introduce better waste management systems in their buildings. This Workshop is designed to provide the basic in waste management including waste management strategy, waste separation and collection, community engagement and education program, and on-site food waste treatment for property managers or relevant stakeholders.

The Workshop will be conducted on 5th May 2011 (Thursday) afternoon through a series of public lectures and open floor discussion. Tentative program (please check our conference website for the most updated lecture program) is shown below:

1.	Opening/ Introduction **Mr Elvis Au, Assistant Director, Environmental Protection Department, HKSAR Government**	2:00-2:05pm
2.	Status of waste management in Hong Kong **Representative of Environmental Protection Department, HKSAR Government**	2:05-2:25pm
3	Implementation of the "Pay Per Bag System" in Taipei – role of property management **Representative of Environmental Protection Department,**	2:25-2:45pm

	Taiwan	
4	Factors leading to Taiwan's successful experience in household waste management **Prof. Shin-Cheng Yeh, Director, Graduate Institute of Environmental Education, National Taiwan Normal University, Taiwan**	2:50 – 3:10pm
4.	Coffee Break	3:10-3:25pm
5.	Public participation in waste separation and management **Dr. Paul Johannes, German Technical Cooperation with AHT GROUP AG**	3:25-3:45pm
6.	Food waste management in Hong Kong **Prof. Jonathan Wong, Director, Sino-Forest Applied Research Centre for Pearl River Delta Environment (ARCPE); Director, Hong Kong Organic Resource Centre; Professor, Department of Biology, The Hong Kong Baptist University, Hong Kong**	3:45-4:05pm
7.	Case Sharing **Sharing of experience in waste management by property management companies in Hong Kong**	4:05-4:25pm
8.	Open Floor Discussion	4:25-4:50pm
9.	Concluding Remark	4:50-5:00pm

Who should attend: Property managers or supervisors, academics, students, NGOs, government officials.

Certificate of Continuing Professional Development (CPD) can be issued only by special request.

Registration method

1. Please download the printable registration form here and send it to arcpe@hkbu.edu.hk (please indicate "registration for public lecture" in the subject line) **on or before 20 April 2011.**

2. Check your e-mail account for registration confirmation. If you do not yet receive any confirmation after 28 April 2011, please contact Ms. Karen Woo at 3411 2091.

Terms and conditions:

1. Registration is on a first-come-first-served basis.
2. The Organizer reserves the right to cancel the lecture should there be insufficient participants or other reasons.
3. Applicants will be notified by email to confirm successful registrations.
4. Applicants are expected to attend the lecture at the place and time specified in the lecture program unless otherwise notified.

5. Before the lecture commences or during the lecture, if Typhoon Signal No.8 or above/ Black Rainstorm Warning is in force; or Typhoon Signal No.8 above will be hoisted within 2 hours, the event will be cancelled.

General enquiry:
Email: arcpe@hkbu.edu.hk
Tel: (+852) 3411 2537
Fax: (+852) 3411 2095

The Status and Policy of MSW Reduction and Recycling in Taiwan

Presenter: Lai Ying-ying
May, 2011

Outline

- Background
- Current status
- Policy and goal
- Implementation measures
- Future prospects

Background

Natural Resource Constraints

- Population: 23 million
- Square measure: 36000km²
- Population density: 624 person/km²
- 98% of energy is imported.
- Taiwan is deficient in natural resources.
- Resource conservation and recycling is important for Taiwan's sustainable development.

Blue sky and green land

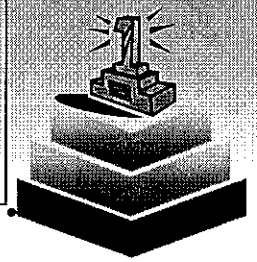
Green mountains and clean water

Sustainable health

Previous main issues

- Increase of waste generation and diversification of waste characteristics
- Not-in-my-backyard – lands are limited for landfill or incinerator
- Arguments against incinerators due to Dioxin issues
- "Throw-away society" consuming pattern

The goal of zero waste



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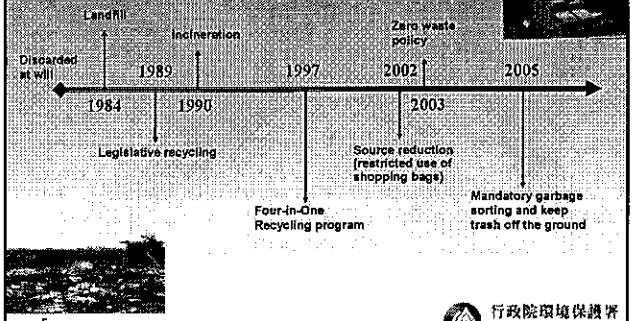
Evolution of waste disposal



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The Evolution of MSW Management

- introduction of EPR
- "Four-In-One" Recycling program
- Taipei City Per Bag Trash Collection Fee System
- promotion of kitchen waste recycling
- promotion of source reduction
- zero waste policy
- mandatory garbage sorting

6

Current status

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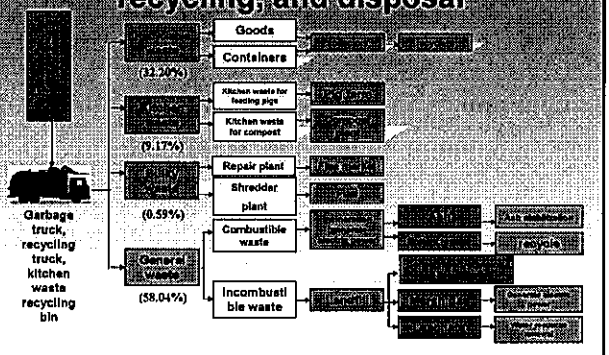
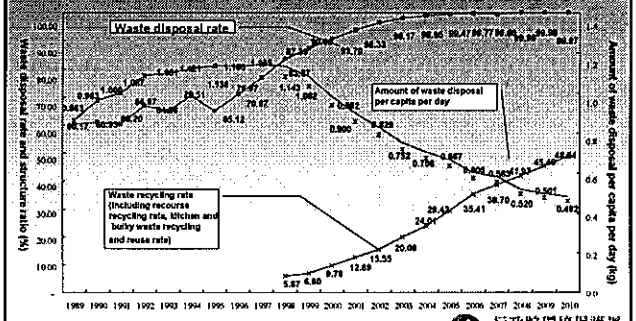
Current framework of sorting, recycling, and disposal



Collection and disposal statistics (1/2)

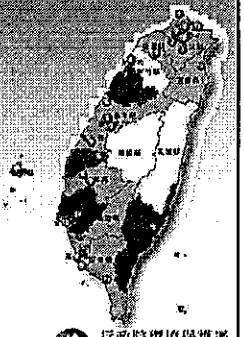


Collection and disposal statistics(2/2)

- **Average daily amount of waste disposal**
  - 1989: 17,147 tons → 1997: 24,331 tons → 2010: 11,153 tons
- **Amount of waste disposal per capita per day**
  - 1989: 0.863 kg → 1997: 1.143 kg → 2010: 0.482 kg
  - In 2010, the amount is 54.16% less than the highest record.
- **recycling rate**
  - 2000: 9.78% → 2007: 38.70% → 2010: 48.84%
  - 2010 resource recycling rate 38.15%; kitchen waste recycling rate 9. 6%; bulky waste recycling rate 1.03%
- **Proper waste disposal rate**
  - 1989: 60.17% → 2010: 99.97%

Disposal facilities

- Waste incineration plant
  - 24 incineration plant running. The designing disposal amount reaches 24,650 tons/day.
  - The disposal method has turned from "landfill" to "incineration," accounting for 95.48%.
- Waste landfill
  - 67 landfills still running at the end of 2010.
  - All landfills are close to their saturation point. The conservation for closed landfills is proceeding.



Policy and goal

Policy and goal

- Advocating the establishment of a resource recycling-based society with zero waste and complete recycling through green production, green consumption, source reduction, recycling, reuse, and renewal to effectively recycle and reuse resources.
- By 2016, the amount of garbage collection will be 70% less than the highest record (1998) and the recycling rate will reach 60%.

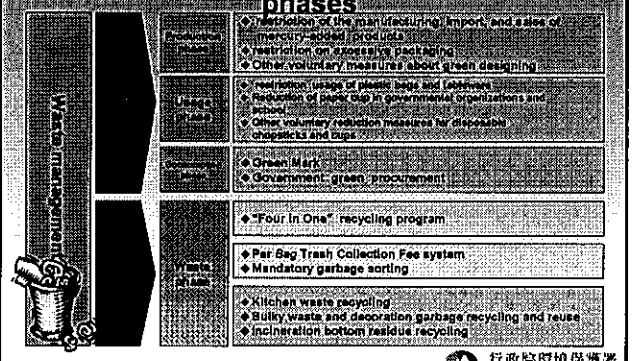
Policy instruments

- Extended producer responsibility (EPR)

- Policy instruments
  - Regulation
  - Economic incentives
  - Voluntary agreement
  - Government purchasing

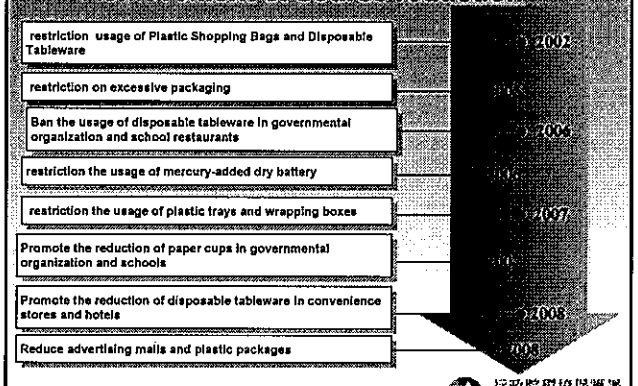
implementation measures

Programs implementation in three phases



行政院環境保護署

Achievement of source reduction



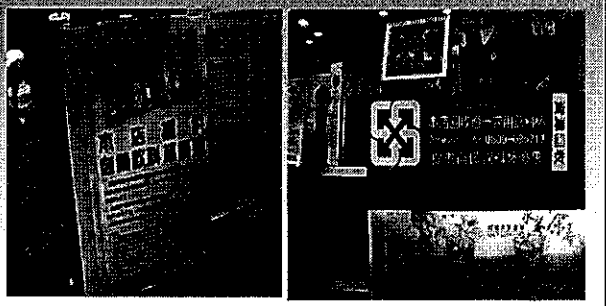
行政院環境保護署

Reduction of drinking cups and recycling

- **Target**
  chain convenience stores, chain fast food restaurants, and chain beverage stores
- **Measures**
  Since May 1st, 2011, should offer discounts for customers with self-prepared drinking cups. Or they should recycle their used drinking cups by providing recycling award—one dollar for two used drinking cups.
- **Goal**
  - 150 companies of a total of 18,500 stores submit and carry out their reduction plans.
  - Reduce 450 millions(30%) of disposable cups per year

行政院環境保護署

Reduction of drinking cups and recycling



行政院環境保護署

Implementation methods

- Basic investigation about the implementing situation
- Communication between all fields
- Public opinion survey
- Cooperative promotion of industries and local Environmental Protection Bureau or environmental protection groups
- Achievement survey before and after the enforcement
- Analysis on the environmental effects (for example: life cycle analysis)
- Propagation (industries, citizens)
- Inspection

Key elements for success

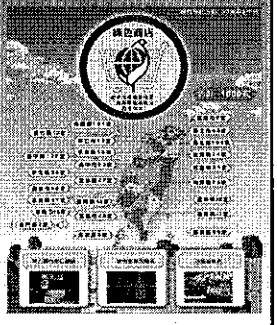
- Effects on citizens, such as whether they can change the habit
- Consumption patterns
- Cost
- Safety and sanitation
- Social culture
- Effects on industries

Green consumption

■Green Mark Program
- ✓ 112 product categories
- ✓ applied scope extends to service industry (such as hotel).
- ✓ There are 6,031 products corresponding to the conditions such as recyclable, low pollution, and resource saving

■Promote green procurement. In 2010, both public and private sections amounted to NT$12 billion, including 9.1 from governmental organizations.

■Assist 10,373 retail sales to turn into green stores.

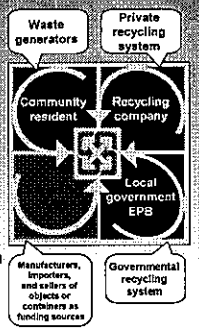


Four-in-One Recycling program (1/3)

- Four-in-One Recycling System

1. Community residents
- Community residents form voluntary recycling organizations
- Promote household garbage sorting

4. Recycling fund
- Establish effective recycling programs
- Recycling as the mandatory responsibility of manufacturers, importers, and sellers
- Invest budget in promoting the operation of recycling system

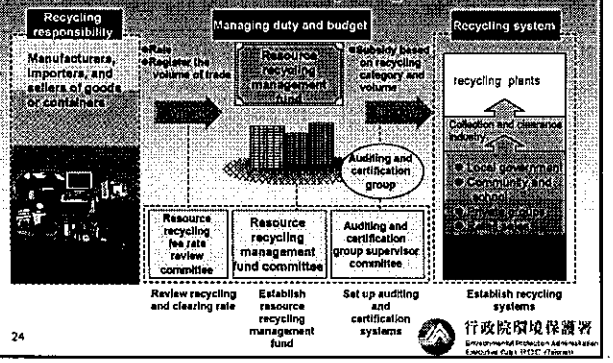


2. Recycling company
- Encourage the development of private industries
- Collect recyclables from citizens, communities, and EPB

3. Local government
- Separately collect recyclables and general garbage
- Revenues of selling recyclables feed back to participants and sanitation crews

Four-in-One Recycling Program (2/3)

- Operation of resource recycling fund



Four-in-One Recycling Program (3/3)

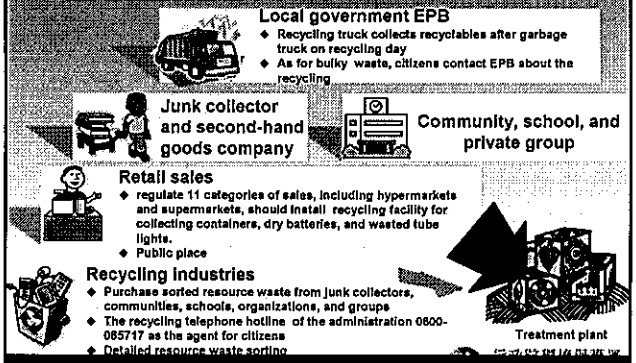
- Mandatory recyclable items

Recyclable items	Year mandated	Recycling rate (%)		
		2008	2009	2010
Containers	1989	85.88	66.17	73.51
General batteries	1999	67.26	50.85	42.45
Automobiles/Motorcycles	1994	72.86	91.04	80.83
Car batteries	1990	62.08	37.15	74.21
Tires	1989	68.68	68.60	72.10
Lubricants	1990	44.01	61.81	71.72
Household appliances	1997	53.26	55.60	61.83
Electronics IT products	1997	39.05	31.83	40.90
Light bulbs	2002	66.48	67.42	80.02

Voluntary agreements

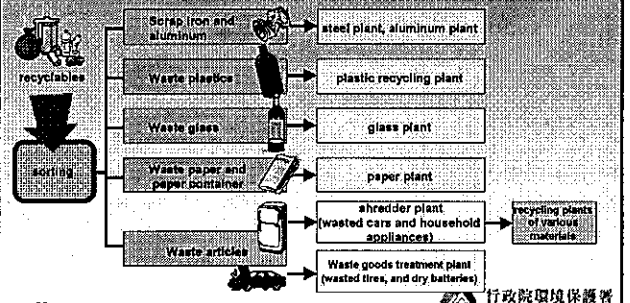
- Mobile phone recycling
  - Signed Memorandum with 22 mobile carriers
  - 10,373 Collection points
  - providing free take-back service for mobile phone and accessories wastes from the public.
- Recycling of Styrofoam packaging
  - Signed contract with CTEPRA
  - Building recycling system of the Styrofoam packaging. In year 2010, 1,329 metric tons of Styrofoam packaging waste has been recycled.

Recyclables' collection



Recycling

- After the sorting, recyclables is sent to various recycling plants according to the materials of containers or goods for recycling:



Kitchen waste recycling

- After straining the water of kitchen waste, households send it to EPB for following recycling
- Usage:
  - Serve as pigs' forage after high temperature cooking
  - Serve as compost at private or public composting plants
  - Serve as compost in households

Bulky waste and Construction waste reuse and recycling

- Bulky waste

Bulky waste worth repairing such as wasted furniture will be reused after repairing, the rest bulky waste is dismantled, sorted, and reused for composting modifier and fuel.

Repair store

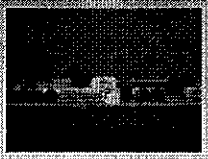
- Construction waste

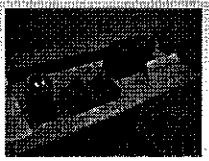
Construction waste generated as a result of renovation, demolition from household is sent to collecting system and sorting center. Various materials are sorted out and reused.

Shredder plant

Incineration bottom residue recycling

- Incineration bottom residue management and reuse
  - Incineration bottom residue can be recycled for the additive of plain concrete, additive of bituminous concrete, additive of bricks, road grade proportion, and substitute for cover soil in landfills.
  - The recycle increased to 89.6% at the end of 2010.





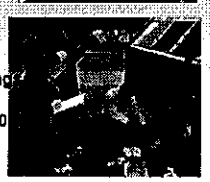
Mandatory garbage sorting(1/2)

- **Implementation schedule**
  - two-stage program in 2005 and 2006 respectively throughout nationwide
- **Content**
  - Keep trash off the ground
  - households are required to separate garbage into 3 categories: recyclables, food waste and trash
  - Inspections of garbage brought out by households for disposal
  - fail to sort garbage will be given instructions and asked to either sort their garbage right then or take it home and sort it.
  - Violators can be fined from NT$1,200 to 6,000

Mandatory garbage sorting(2/2)

Checking trash bag at a trash hauler

Checking trash bag in collection bins
Fine NT$1,200-6,00



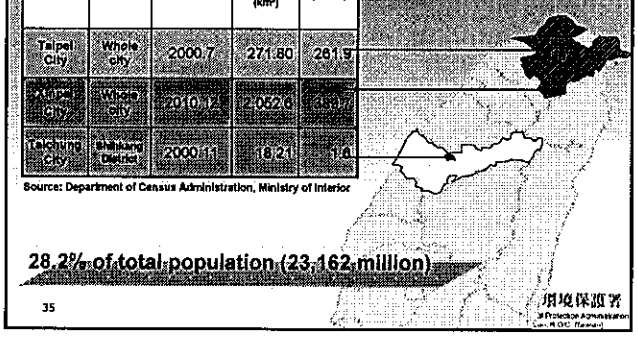
Per Bag Trash Collection Fee System

- The per-bag fee calculated based on the volume of waste collected.
- Replace the original system which Trash Collection Fee collected along with tap water fee.
- EPB produces and sells the exclusive garbage bags for citizens. The payment includes trash collection fee. EPB cleans garbage packaged by the exclusive garbage bag only.
- However, EPB collects recyclables for free.
- The less volume of waste you dispose, the less number of refuse bags you would need and therefore the less you would have to pay for waste disposal.
- Considering the feasibility for human resources, facility, and finance of local governments , EPA assists willing and feasible local governments to enforce the system gradually.

Cities enforcing Per Bag Trash Collection Fee System

Cities	Enforcing area	Enforcing time	Square measure (km²)	Population (million)
Taipei City	Whole city	2000.7	271.80	2619
[illegible] City	Whole city	2010.1.1	2,052.6	[illegible]
Taichung City	Shalu and Dadu Districts	2000.11	8.21	1.6

Source: Department of Census Administration, Ministry of Interior



28.2% of total population (23,162 million)

Current achievements of enforcing Per Bag Trash Collection Fee Policy

- The achievements of enforcing Per Bag Trash Collection Fee Policy in each city

	Unit	Taipei City	Xinpei City	Shihkang Township
Original amount of waste	(tons/day)	2870	2497	11.76
Amount of waste after the enforcement	(tons/day)	1066	1200	3.26
Daily reduction of waste	(tons/day)	-1804	-1297	-8.5
+/- rate		-64.11%	-51.94%	-72.28 %
Original amount of resource recycling	(tons/day)	73	175	0.76
Amount of resource recycling after the enforcement	(tons/day)	1241	220	2.79
Daily increase or reduction of resource recycling	(tons/day)	1168	45	2.03
+/- rate		1600%	25.71%	267.11%
Original amount of kitchen waste	(tons/day)	13	173	1.73
Amount of kitchen waste after the enforcement	(tons/day)	230	405	2.19
Daily increase or reduction of kitchen waste	(tons/day)	217	232	0.46
+/- rate		1669.23%	134.39%	26.59%

Note: For Taipei City, the amount of waste and resource recycling indicates the competion between 1998 and 2010; the amount of kitchen waste indicates the comparison between 2003 and 2010. For Xinpei City, the amount of waste indicates the comparison between 2008 (January to December) and December, 2010; the amount of resource recycling and kitchen waste indicates the comparison between January to June, 2008 and December, 2010. For Shihkang Township, the amount of waste and resource recycling indicates the comparison between 1998 (January to November) and 2010 (January to November); the amount of kitchen waste indicates the comparison between 2003 (January to August) and 2010 (January to August).

行政院環境保護署
Environmental Protection Administration Executive Yuan, R.O.C. (Taiwan)

The enforcement of Per Bag Trash Collection Fee Policy – take Taipei City as example

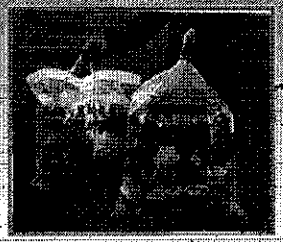
Specification and price of present exclusive garbage bags

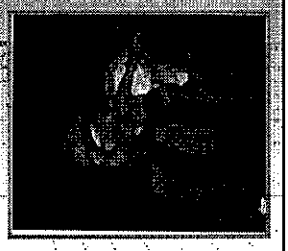
Number	Model number	Volume (litter)	Size (mm)	Thickness (mm)	Package piece/pack	Price(NT) dollar/pack	Note
1	6 litter bag	6	310(w) x 500(L)	0.05	20	45	Portable bag
2	14 litter bag	14	430(w) x 615(L)	0.05	20	126	Portable bag
3	25 litter bag	25	550(w) x 750(L)	0.06	20	225	Portable bag
4	33 litter bag	33	630(w) x 720(L)	0.06	20	297	Flat bag
5	76 litter bag	76	840(w) x 900(L)	0.07	10	342	Flat bag
6	120 litter bag	120	940(w) x1100(L)	0.1	5	270	Flat bag

Trash Collection Fee : NT$0.45/litter

The enforcement of Per Bag Trash Collection Fee Policy – take Taipei City as example

Exclusive garbage bags for Per Bag Trash Collection Fee Policy





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Environmental Protection Administration Executive Yuan, R.O.C. (Taiwan)

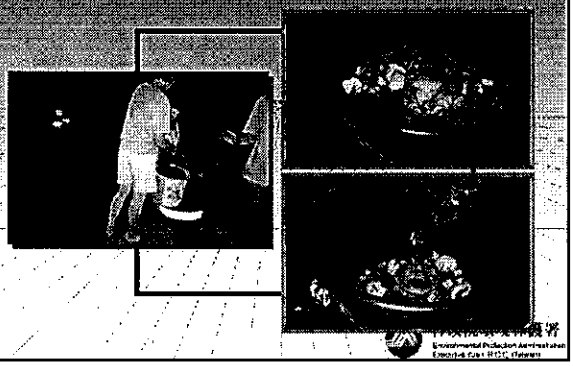
The enforcement of Per Bag Trash Collection Fee Policy – take Taipei City as example

Recyclable resources passed on to the recyclable trucks

行政院環境保護署
Environmental Protection Administration Executive Yuan, R.O.C. (Taiwan)

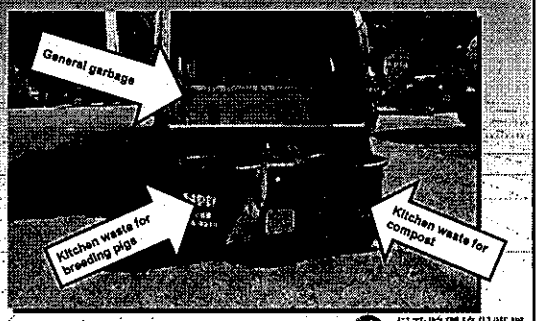
The enforcement of Per Bag Trash Collection Fee Policy – take Taipei City as example

Kitchen waste collection and clearance



The enforcement of Per Bag Trash Collection Fee Policy – take Taipei City as example

Kitchen waste collection and clearance

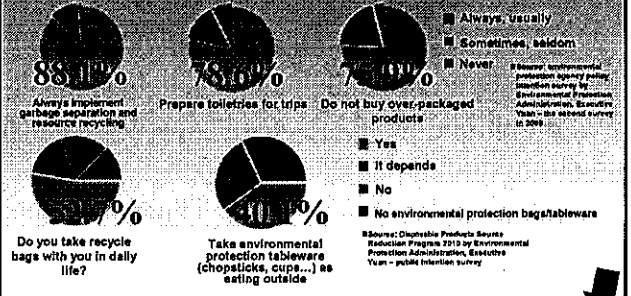


Key elements for success

- Educate the public zero-waste knowledge and concept, help citizens develop the consensus of public participation to call for public environmental protection action.
- Adopts a gradual approach
- The determination of the Chief, and support from local council, mediums and industries, and environmental groups, together with full cooperation with the various departments.
- Garbage collection and disposal system, recycle methods and system have been established.
- With incentives to reduce garbage, this would encourage the public to take responsibilities for reduction.
- With waste reduction, should adjust the frequency and method of garbage collection, to raise efficiency

Implementation measures – take the promotion of garbage separation as example

- Public opinion



- Reducing rate of waste production: 2010 is 15.66% less than 1998

Future prospects

- The capacity of existing landfills is seriously insufficient. It is hard to establish new final treatment facilities. Therefore, we should promote final treatment facilities.
- For dealing with global warming and realizing the policy of energy saving and carbon reduction, retiring incinerators are gradually turned into biomass energy center. We should promote highly efficient application of biomass power.
- Following the trend of sustainable material management in the world, we should draw up the integral and sustainable policies for material cycle, increase resource productivity and resource efficiency.

The end.
Look forward to your advice.

Implementation of the "Pay Per Bag System" in Taipei City

Presenter: Ying-Ying Lai
May, 2011

Outline

- Background
- Evaluation and Planning before the implementation
- Per Bag Trash Collection Fee System
- Achievements
- Conclusion

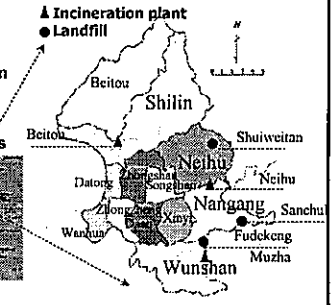
1

Background

2

Taipei City

- Square measure: 271.7997 km²
- Population: 2,622,923, 12% of total population in Taiwan
- Divided into 12 administrative districts



3

The Evolution of Waste Management

Number	Treatment	Location	Time	Implementation
1	Open dumping	Neihu	1970-1985	Open dumping, Neihu garbage mountain beside Keelung River
2	Landfill	Fudekeng Sanchaiku	1985-1994 1994-	Sanitary landfill Sanitary landfill
3	Incineration	Neihu Plant Muzha Plant Beitou Plant	1992- 1995- 1999-	Each plant is normally operation
4	Recycling		1992-	Resource recycling with routine sites and routes twice each week
5	Three in one recycling program		1996.03- 1997.04-	Keep trash off the ground policy and three in one resource recycling project
6	Per *Bag* Trash Collection Fee system		2000.07-	Overall enforcement of Per Bag Trash Collection Fee Policy. Three times of resource recycling each week.
7	recyclables sorting daily		2003.05-	Five days for recycling each week. Promote daily sorting recycling.
8	Kitchen waste recycling		2003.12-	Free kitchen waste recycling
9	Mandatory separation		2005-	Divide into three categories such as general garbage, kitchen waste, and recyclables

4

Method of collecting trash fee before the implementation

- Taipei City began collecting trash collection fee since 1991
- According to "General Waste Clearance and Disposal Fee Collection Regulations", the original collecting methods of trash collection fee:
  - ✓ Tap-water users: the trash collection fee is included in water fee. Environmental Protection Bureau entrusts Taipei Water Corporation to collect the fees. The more water residents use, the higher trash collection fees will be.
  - ✓ Non-tap-water users: fixed fees are charged seasonally. The fee can be transferred by residents or be collected by representatives of Environmental Protection Bureau.

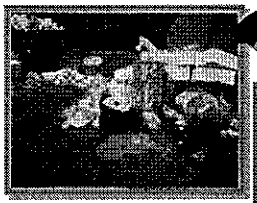
5

Garbage collection and recycling before the implementation

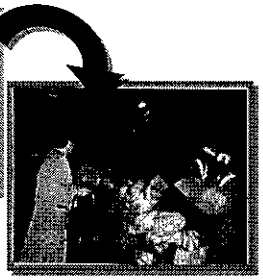
- Recyclables were recycled twice a week since 1992
- "Keep Trash off the Ground Program" was promoted since March 1996. From April 1997, all administrative districts have implemented
- Since April 1997, "Three in One Recycling System" has been implemented. In each administrative district, recycling trucks followed the garbage truck and collect recyclables from residents two days a week. "Garbage Separation," "Recycling," and "Garbage Clearance" are integrated and completed once.

6

"Keep trash off the ground "



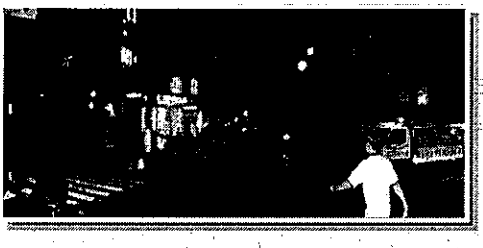
(a) Before the implementation of keep trash off the ground



(b) After the implementation of keep trash off the ground

7

"Three in one" recycling program



8

Main issues of the "water-based" trash collection system

- The amount of the fee is not related to the amount of garbage. It does not accord with "The Polluter Pays Principle" .
- It is unfair that people using disposable tableware and littering it do not need to bear the cost of trash collection
- There is no incentives for promoting recycling and waste reduction
- It is ironic that trash collection fee is higher than water fee
- 1999.6.30: Taipei City Council demanded to enforce Per Bag Trash Collection Fee Policy since 2000.7.1, or the city government would not collect trash collection fees.

9

Evaluation and Planning before the implementation

10

Evaluation before the implementation

- Analysis by SWOT
  - S: Strength
    - ✓ citizen awareness and knowledge about recycling
    - ✓ Keep trash off the ground has been implemented
    - ✓ Garbage separation has been implemented successfully and industries are responsible for recycling
    - ✓ Outstanding staffs in the city government
    - ✓ "The Polluter Pays Principle"
    - ✓ More trash collection fees are saved
    - ✓ The elected mayor is reputable and emphasizes the issue
    - ✓ "Three in one" recycling program has been implemented

11

Evaluation before the implementation

- W: Weakness
  - ✓ Citizens must change their habits and buy exclusive bags
  - ✓ The high price of exclusive bags may cause misunderstanding
  - ✓ Garbage is divided into diverse categories
  - ✓ There are no similar experiences in Taiwan. Systems and enforcing measures must be studied and established
  - ✓ Increased the cost for producing exclusive bag and management
  - ✓ The income of trash collection fee reduce

12

Evaluation before the implementation

- O: Opportunity
  - ✓ Consciousness of environmental protection has raised. It has become a trend to promote waste reduction and resource recycling measures due to the earth's resources are insufficient or limited.
  - ✓ There are successful experiences in other countries.
  - ✓ Determination of the administrators
  - ✓ The support from environmental groups and the legislative body

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Evaluation before the implementation

- T: Threat
  - ✓ Exclusive bags are counterfeited
  - ✓ Some citizens are keen on saving money, violate the law, and discard ordinary trash bags.
  - ✓ Traditional markets, part of citizens, and councilors oppose.
  - ✓ Recyclables will increase massively but recycling trucks are insufficient. General garbage will decrease and garbage trucks will be superabundant.

14

Strategy

- Per Bag Trash Collection Fee System
  - ✓ The per-bag fee calculated based on the volume of waste collected.
  - ✓ Replace the original system which Trash Collection Fee collected along with tap water fee
  - ✓ EPB produces and sells the exclusive garbage bags for citizens. The payment includes trash collection fee. EPB cleans garbage packaged by the exclusive garbage bag only.
  - ✓ However, EPB collects recyclables for free.
  - ✓ The less volume of waste you dispose, the less number of refuse bags you would need and therefore the less you would have to pay for waste disposal.

15

Preparation before the implementation

- April to July, 1998

  Pilot plan was carry out in six villages in Zhongshan District and one village in Daan District. Citizens are willing to cooperate with the system.

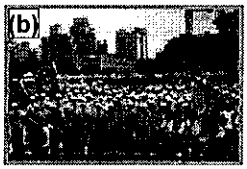
- "planning and designing of the exclusive garbage bags," "per bag trash collection fee rate," and "establishing the marketing system of Per Bag Trash Collection Fee Policy." The planning of three policies were completed in 1999.

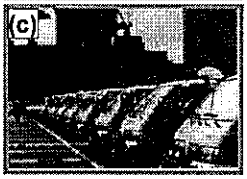
Preparation before the implementation

- January to June 2000
  - ✓Legislation of Per Bag Trash Collection Fee System
  - ✓Establish marketing system of exclusive garbage bags
  - ✓delivery of exclusive garbage bags for free and coupons for every household
  - ✓Production and delivery of exclusive garbage bags
  - ✓Group training of assistant volunteers
  - ✓Propagation of Per Bag Trash Collection Fee System
  - ✓Rearrangements of crews and vehicles for garbage clearance and recycling

  With the implementation of Per Bag Trash Collection Fee Policy, recycling day will increase to three times a week

Propagation





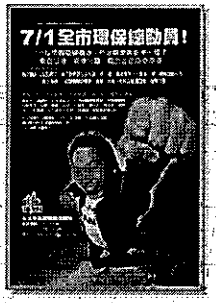
(a)Mayor Ma hosts the Startup ceremony of Per *Bag* Trash Collection Fee System.

(b)The assistant volunteers.

(c)The team of recycling trucks

Per Bag Trash Collection Fee System

Exclusive garbage bags



Per Bag Trash Collection Fee System

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Implementation measures

- Taipei City government has implemented Per Bag Trash Collection Fee System since July 1st, 2000.
- It includes exclusive bags and Authentication Label. Exclusive garbage bags are taken as the mean of collection for waste clearance and disposal fees.
- As throwing garbage, citizens have to buy exclusive garbage bags produced by EPB and sold at designated locations. Garbage trucks of EPB collect garbage packaged with the exclusive garbage bags only.
- However, EPB deals with resource recycling and bulky waste for free.

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Implementation measures

- Exhortation and inspection
- recycling measures
  - ✓ Three recycling days a week instead of two days a week. Garbage was no longer collected on Sundays since October 1st, 2000. Besides Sundays, garbage was no longer collected on Wednesdays since May 7th, 2003. five recycling days a week from then on.
  - ✓ Implement programs for organizations and schools to cooperate with Per *Bag* Trash Collection Fee Policy and waste reduction.
  - ✓ Add clean Expandable Polystyrene and plastic bags into recyclable items.

22

Implementation measures

- The practice of residential building community
  - Sub-contract private companies to transport garbage

    Charges by weight when sending to the incinerator
  - Purchase of garbage bags
    - ✓ Residential building community joins together to purchase large type of garbage bags, and will send the filled garbage bag to the sanitation crew directly
    - ✓ Each household will purchase small types of garbage bags by themselves, and will send the filled bag to the sanitation crew directly, or place them at the collection points in the community which the management committee will send the collected garbage to the sanitation crew.

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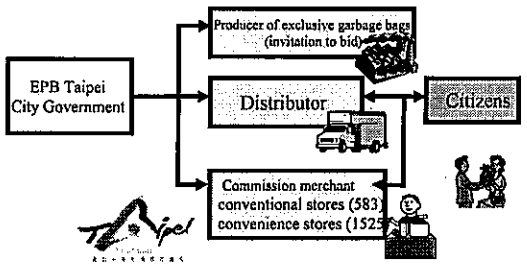
Size and price of exclusive garbage bags

Number	Model	Volume (litter)	Size (mm)	Thickness (mm)	Package piece/pack	Price NT/pack	Note
1	5 litter bag	5	310(w) x 500(L)	0.05	20	45	Portable bag
2	14 litter bag	14	430(w) x 615(L)	0.05	20	126	Portable bag
3	25 litter bag	25	550(w) x 750(L)	0.06	20	225	Portable bag
4	33 litter bag	33	630(w) x 720(L)	0.06	20	297	Flat bag
5	76 litter bag	76	840(w) x 900(L)	0.07	10	342	Flat bag
6	120 litter bag	120	940(w) x1100(L)	0.1	5	270	Flat bag

Trash Collection Fee : NT$0.45/litter

24

Distribution system of exclusive garbage bags



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Exclusive garbage bags

(c)

(a) Exclusive garbage bag and its package
(b) Exclusive garbage bag's logo and marks of exclusive agencies
(c) Authentication label. concealed characters are designed for exclusive bags so that inspectors can identify the counterfeit bags.

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Time table and methods of garbage separation and collection

Item	Collection time	Collection measures	Item
1. General garbage		Monday, Tuesday, Thursday, Friday, Saturday	Garbage trucks
2. Kitchen waste	Red bucket	Monday, Tuesday, Thursday, Friday, Saturday	Kitchen waste buckets behind garbage trucks
	Blue bucket		
3.Recyclables	Plane resources (second hand clothes, waste paper)	Monday, Friday	recycling trucks (wasted light tubes, circular fluorescent light tubes, energy saving bulbs, incandescent bulbs, wasted dry batteries, wasted containers of environmental sanitation pesticides, wasted compact disks, and cell phones are collected on Monday, Tuesday, Thursday, Friday, and Saturday.)
	Dimensional resources (clean plastic bags, polystyrene, general resources))	Tuesday, Thursday, Saturday	

Note: Resources and waste are not collected on Wednesday and Sunday.
There are 187 collection routes and 4099 sites for nighttime collection at fixed time and location.

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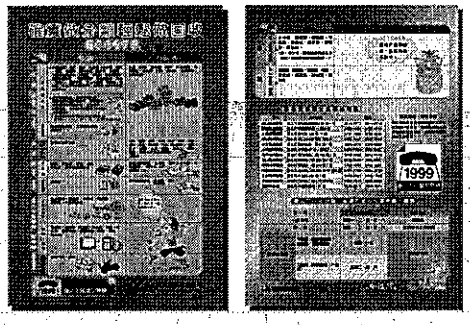
Propagation of garbage separation methods



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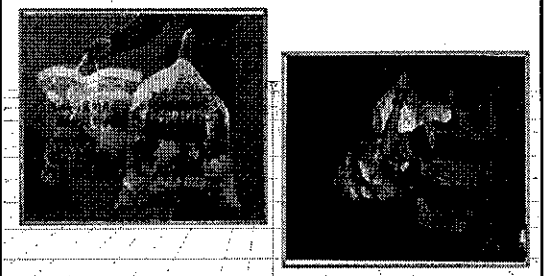
Exclusive garbage bags for Per Bag Trash Collection Fee System



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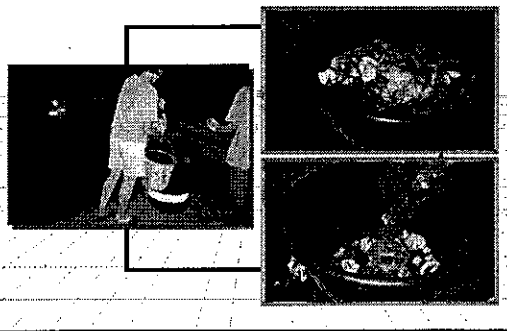
Recyclables passed on to the recycling trucks

30

Kitchen waste collection



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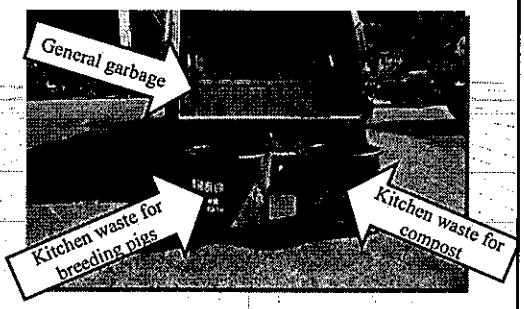
Kitchen waste collection and



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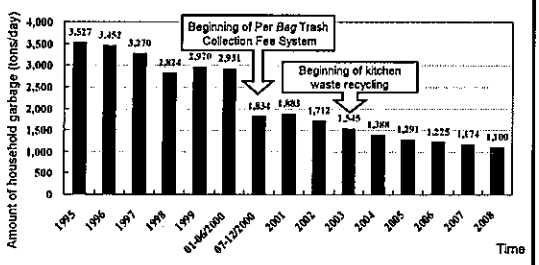
Achievements

33

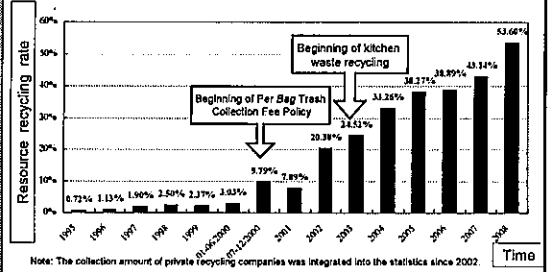
Achievements



MSW Reduction Over the Years

34

Achievements

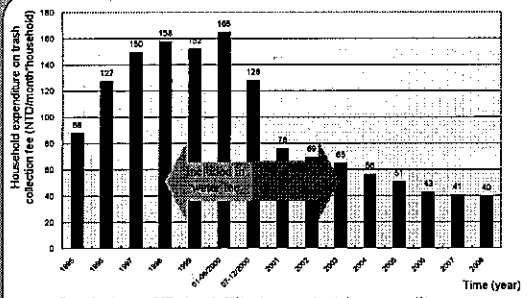


Note: The collection amount of private recycling companies was integrated into the statistics since 2002.

Recycling Statistics over the Years

35

Achievements



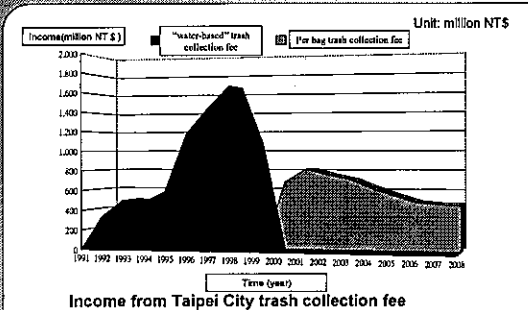
Statistics of Taipei City household expenditure on trash collection fee over years

Achievements

Statistic of exclusive garbage bag producing and marketing cost

A.D. (year)	Producing cost of exclusive garbage bags (NT$)	Exclusive garbage bag commission charge (NT$)	Exclusive garbage bag distribution fee (NT$)	Total (NT$)	Actual income (NT$)	Ratio (%)
2000	166,026,803	50,505,196	14,967,742	231,499,741	682,403,445	33.92
2001	54,993,100	45,708,319	22,554,781	123,256,200	815,918,371	15.11
2002	65,168,695	44,207,288	24,000,000	133,373,983	756,087,048	17.64
2003	42,539,730	41,700,750	27,850,000	112,090,480	712,474,071	15.73
2004	40,738,410	36,702,577	28,200,000	105,640,987	625,137,334	16.90
2005	40,852,000	32,245,000	28,200,000	101,297,000	550,343,890	18.41
2006	46,344,500	26,773,155	20,343,404	95,461,059	485,004,944	19.68
2007	53,000,000	27,609,191	19,543,056	100,152,247	463,542,650	21.61
2008	99,570,332	25,634,239	19,543,055	144,747,627	440,132,925	32.89

Achievements



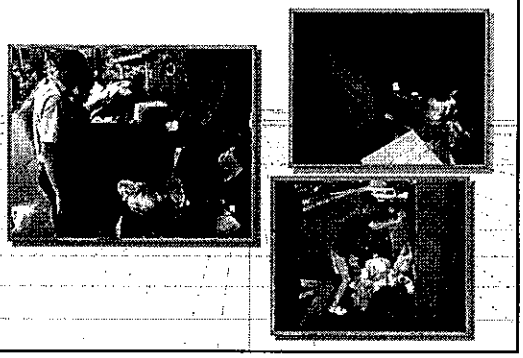
Income from Taipei City trash collection fee

Achievements

■2005-2008 statistic of illegal garbage disposal cases

Category	55,761	8,020	14,559	19,734	13,448
Use fake exclusive garbage bags	1,717	732	547	338	100
Illegal disposal of bulky waste	778	-	2	662	114
Use ordinary garbage bags instead of exclusive garbage bags	5,765	591	787	623	3,764
Illegal exclusive garbage bags	9,568	1,865	1,935	1,200	4,568
Commission private companies to collect garbage but dump the garbage outdoors	2,516	213	243	250	1,810
Recyclables bags with illegal general garbage	15,906	2	332	13,375	2,197
Kitchen waste bags with illegal general garbage	4,053	-	47	3,186	820
Illegal general waste clearance and disposal	15,458	4,617	10,666	100	75

Inspection
illegal disposal of garbage bags



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Conclusion

- Educate the public zero-waste knowledge and concept, help citizens develop the consensus of public participation to call for public environmental protection action.
- Adopts a gradual approach
- The determination of the Chief, and support from local council, mediums and industries, and environmental groups, together with full cooperation with the various departments.
- Garbage collection and disposal system, recycle methods and system have been established.
- With incentives to reduce garbage, this would encourage the public to take responsibilities for reduction.
- With waste reduction, should adjust the frequency and method of garbage collection, to raise efficiency

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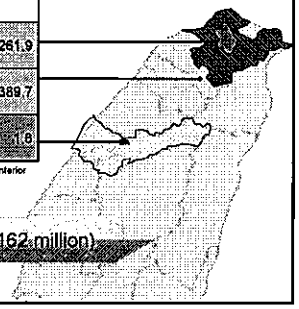
Cities enforcing Per Bag Trash Collection Fee Policy

Cities	Enforcing area	Enforcing time	Square measure (km^2)	Population (million)
Taipei City	Whole city	2000.7	271.80	261.9
Kaohsiung City	Whole city	2010.12	2,052.6	389.7
Taichung City	Shinkang District	2000.11	18.21	1.8

Source: Department of Census Administration, Ministry of Interior



28.2% of total population (23.162 million)

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Present achievements of enforcing Per Bag Trash Collection Fee Policy

The achievements of enforcing Per Bag Trash Collection Fee Policy in each city

	Unit	Taipei City	Xinpei City	Shihkang Township
Original amount of waste	(tons/day)	2970	2497	11.76
Amount of waste after the enforcement	(tons/day)	1066	1200	3.28
Daily reduction of waste	(tons/day)	-1904	-1297	-8.5
+/- rate		-64.11%	-51.94%	-72.26 %
Original amount of resource recycling	(tons/day)	73	175	0.76
Amount of resource recycling after the enforcement	(tons/day)	1241	220	2.79
Daily increase or reduction of resource recycling	(tons/day)	1168	45	2.03
+/- rate		1600%	25.71%	267.11%
Original amount of kitchen waste	(tons/day)	13	173	1.73
Amount of kitchen waste after the enforcement	(tons/day)	230	405	2.19
Daily increase or reduction of kitchen waste	(tons/day)	217	232	0.46
+/- rate		1569.23%	34.10%	26.69%

Note: For Taipei City, the amount of waste and resource recycling indicates the comparison between 1999 and 2010, the amount of kitchen waste indicates the comparison between 2003 and 2010. For Xinpei City, the amount of waste indicates the comparison between 2008 (January to December) and December, 2010, the amount of resource recycling and kitchen waste indicates the comparison between January to June, 2008 and December, 2010. For Shihkang Township, the amount of waste and resource recycling indicates the comparison between 1999 (January to November) and 2010 (January to November) the amount of kitchen waste indicates the comparison between 2003 (January to August) and 2010 (January to August).

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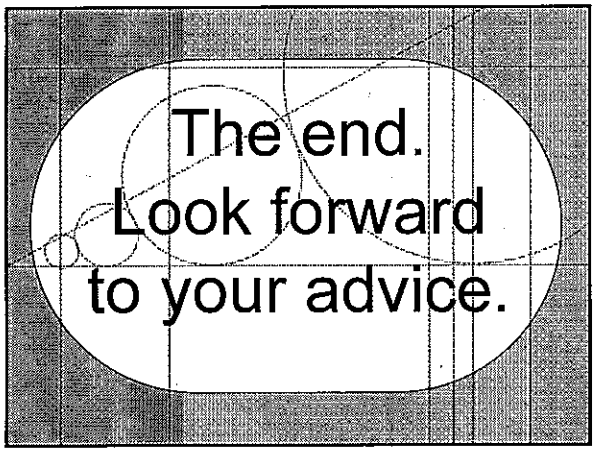
The end.
Look forward
to your advice.

Circular Economy in the European Union and in Germany - Contribution to Resource Efficiency and Climate Protection

H. Wendenburg

Director General, Directorate Water Management, Waste Management, Soil Protection, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany.

Sustainable Waste Management is an environmental, social and economic challenge – worldwide. In the European Union as well as in Germany, waste management has been at the centre of environment policy in recent years and some substantial progress has been made.

The EU Thematic Strategy on the prevention and recycling of waste aims to create new opportunities for waste management options other than landfill and will move the EU decisively onto the path of becoming a "recycling society". In several legislative measures recycling and recovery targets have been set for some key complex waste flows, i.e. packaging, end-of-life vehicles and waste electrical and electronic equipment. Producer responsibility has been established, and separate collection systems for end-of-life products which would otherwise enter the municipal solid waste stream have been extended. New techniques have been developed for the treatment and recycling of waste streams. Heavily polluting landfills and incinerators are being cleaned up. With time, waste is increasingly seen as a valuable resource for industry. And last but not least, diversion of biodegradable waste from landfills and increasing recycling and recovery are contributing to reducing greenhouse gas emissions.

However, despite these successes, there are no reasons to recline. Waste remains a problem in the EU and worldwide.

We have to constitute a rapid expansion of population, an extension of demand for products and an increase of industrialisation. These facts have direct effects to the waste situation. Waste volumes continue to grow and the absolute amount of waste going into landfill is not decreasing. Legislation is, in some cases, poorly implemented and there are significant differences between national approaches. The potential for waste prevention and recycling is not yet fully tapped. Furthermore, waste management generates emissions to air, water and soil as well as other nuisances which contribute to environmental problems, harm human health and cause economic costs.

For this there is the need for a modern policy of sustainability in waste management. Sustainable waste management must be the management of material streams with the goal of conservation of resources.

For this reason, the circular economy is an important element of the German government's resource strategy. On the legal basis of the 1994 Closed Substance Cycle and Waste Management Act, Germany's waste policy has promoted recovery over disposal. Today more than 70 percent of municipal waste is recovered and over 60 percent of household waste is recycled. For traditional recyclables such as paper, glass, iron and steel the recovery quotas are sometimes much higher still.

Furthermore, extending product responsibility to key areas such as electrical and electronic equipment, end-of-life vehicles, packaging, waste oil and batteries has paved the way for ensuring high quotas and

top-quality, non-harmful, environmentally sound recovery for these important waste streams. Separate collection for biological and green waste has been introduced in many districts and cities. More stringent technical requirements have been laid down for landfills, significantly reducing their number and raising environmental standards. The landfilling of untreated municipal waste was ended on 1 June 2005, and compulsory pre-treatment was introduced. This fundamental change to municipal waste management was an important milestone in the development of the waste sector.

But circular economy must be developed further if we are to overcome the challenges of the future. With the implementation of the new European Directive on Waste we are currently developing a new Closed Substance Cycle Waste Management Act which strengthens resource efficiency. Building on a sound waste law concept, besides improving waste avoidance we must now enhance our efforts to reuse waste, to recycle waste from high-quality applications, and to increase the efficiency of energy recovery. We must extract more of the materials which remain in municipal waste, we must use raw materials from the building stock, a practice referred to as urban mining, and we need to consider how we can better recycle electronic appliances in terms of resource efficiency, so that we can reuse their valuable components such as rare metals.

The increasing global scarcity of natural resources thus presents the waste management sector with new challenges - but it also offers new opportunities for the development of innovative and efficient recovery processes. For rising resource prices also make recycling efforts more profitable.

The successes in waste management have also significantly helped to protect the climate. The waste sector's contribution to climate protection is considerable, and plays an important role in meeting Germany's Kyoto targets. Up to 2006, around 56 million tonnes of CO_2 equivalent were saved each year compared to 1990 which roughly corresponds to the annual CO_2 emissions of 7.7 million cars. The waste management sector thus accounts for 20 percent of the reduction in CO_2 of 280 million tonnes which Germany has achieved so far. By 2020 the waste sector can tap further reduction potential of over 10 million tonnes CO_2-equivalent, especially by improving the efficiency of energy recovery, focusing more on materials recovery and optimising the use of biowaste.

The optimisation of waste management structures, further development of technical solutions, increased recycling rates and enhanced use of energy from waste are the challenges we face in the waste area, today and in the future. We have to proceed step by step but we have to speed up the pace. And eventually this means that we need to raise the common awareness that sustainable waste management is a necessity.

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Recycling of Packaging Waste and other Recyclables – A Contribution to Resource Productivity

International Conference on Solid Waste 2011

Moving Towards Sustainable Resource Management

Hong Kong - 3rd May 2011

Thomas Schmid-Unterseh
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
Germany

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Federal Republic of Germany

- 82 Mio inhabitants
- 351 Mio t waste p.a.
- 42 Mio t municipal Waste

in 2007

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Waste Management – A Precondition for Sustainable Development

- reduction of impacts on air, water, soil and human health is still an important objective of waste management policies
- contribution to resource productivity is of growing importance
- waste prevention, recovery and recycling are key elements of a circular economy

Thomas Schmid-Unterseh - Federal Ministry for the Environment - Germany 3

International Conference on Solid Waste 2011 Moving Towards Sustainable Resource Management - Presentation files
2-6 May 2011, Hong Kong

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Closed Substance Cycle Economy

- clear responsibilities for disposal
  - domestic waste: local authorities (disposal fee by household)
  - other waste: private sector
- Extended Producer Responsibility
- separation of recoverable materials
- expanding recycling facilities
- optimizing waste to energy
- landfill ban for untreated waste

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Landfill Ban for Untreated Waste

Waste Storage Ordinance – 2005

- wastes must not be landfilled without pre-treatment
- 68 WIP – 19 mio. t. / cap. and year
- 49 MBWTP – 5,5 mio. t. / cap. and year
- from > 8.000 landfill sites in 1990 to ~160 in 2008

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International Conference on Solid Waste 2011 Moving Towards Sustainable Resource Management - Presentation files
2-6 May 2011, Hong Kong

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Separate Collection

- waste paper
- glass
- packaging waste
- waste batteries
- electrical and electronic equipment
- end of life vehicles
- bio waste
- textiles
- waste oil
- hazardous waste

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Extended Producer Responsibility

- Voluntary agreements about recycling targets
  - waste paper - 1994 -
  - construction and demolition waste - 1996 -
- Legislative acts: Return and recycling /recovery obligations
  - **packaging** - 1992 -
  - end-of-life vehicles - 1998 –
  - waste batteries - 1998 –
  - electrical and electronic scrap - 2005 –

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Packaging Ordinance

- producer has to participate at a „dual system“ for (kerbside) collection/recycling of household packaging
- producer has to pay a fee per package
- „dual systems“ have to collect packaging waste at the households
- collection by disposal enterprises on behalf of the „dual systems“
- „dual systems“ have to achieve recycling targets

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Recycling Quotas for Sales Packaging

- recycling quotas have increased since 1992, when the Packaging Ordinance entered into force
- since 1998:
  - 75% - glass
  - 70% - tin plate, paper and cardboard
  - 60% - aluminium and compounded materials
  - plastics: 36 % material recycling
60 % recovery
- proof required that recycling quotas are met

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Ecological Results

- > 80 Mio t. collected since 1993
- development of recycling technologies and expansion of capacities
- high recycling rates
- significant contribution to reduce GHG-emissions

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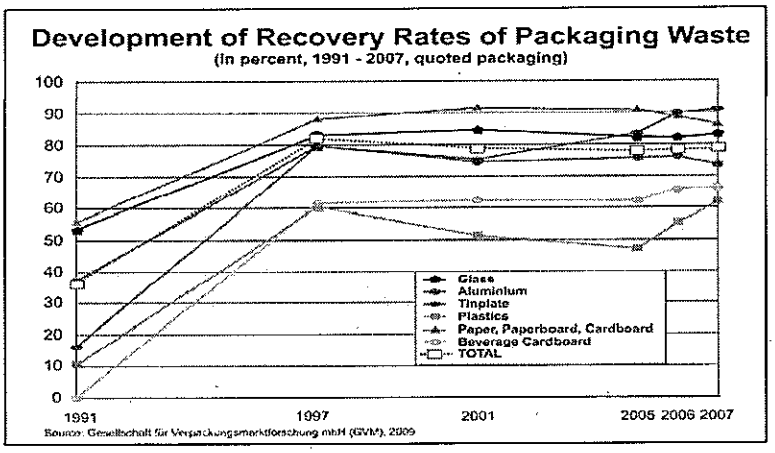
Development of Recovery Rates



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Recovery Rates in 2008

- glass: 82,2 %
- tin plate: 93,6 %
- aluminium: 80,0 %
- total metal: 91,7 %
- paper and cardboard: 91,2 %
- carton liquids packaging: 67,8 %
- plastics: 68,4 %
- total packaging materials: 81,6 %

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Packaging Ordinance: Effective but Expensive

- high costs in the beginning: ~ 2 billion € p.a.
- reduced by competition: ~ 1 billion € p.a.
- e.g. plastic packaging: 1,30 € per kg
- expensive in relation to other EU-MS, but: services are not comparable
- dual systems in Germany have even calculated, that average costs per kg in France (0.30 €) and Austria (0.32 €) are higher than in Germany (0.29 €)

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The Issue of Competition

- Packaging Ordinance of 1991: producers could choose between participation at „dual system“ or taking back at shop
- problem of free-riders
- initially only one „dual system“
- 2009: competition between 9 „dual systems“
- collection in one common „yellow bin“

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Lessons Learned

- EPR and ambitious recycling targets are drivers for collection infrastructure, sorting technology, recycling capacities
- modern technology improves quality of secondary raw material
- high quality secondary raw materials need markets; those markets can be developed
- competition is important for efficiency
- clear regulatory framework is needed for
  - fair competition
  - effective control and enforcement

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Packaging Ordinance: An Issue of Public Discussion

- collection in all regions?
- collection of all household packaging?
- collection by private companies or by municipalities ?
- recycling or energy recovery?
- separate collection or collection together with other municipal waste?

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Mandatory Deposit on One-Way Beverage Containers

- objectives: to support refillable bottles, to foster material recycling, to reduce littering
- based on lifecycle analysis
- avoid waste, use less energy, have less share to greenhouse effect and reduce littering
- instrument: mandatory deposit (0.25 €) for one-way packaging beer, water, soft drinks
- exception: ecologically beneficial one-way packaging (cartons, polyethylene tubular bags, stand-up bags)
- producers and retailers established a common take-back system (DPG)

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Mandatory Deposit – Data

Share of reusable packaging in drinks consumption by type of drink (in %) in the Federal Republic of Germany

Type of drink	2004	2005	2006	2007
Beer	87,8	88,6	87,1	86,0
Mineral water	68,2	61,4	53,0	47,3
Soft drinks	63,0	55,0	49,3	42,8
Mixed alcoholic drinks	25,7	24,7	31,8	23,1
Weighted average for these types of drink	71,1	65,7	59,8	54,7
Share of reusable packaging	66,3	61,3	55,6	51,3
Share of ecologically advantageous one-way packaging	4,9	4,4	4,2	3,4

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Beyond Packaging Waste: The Recycling Bin

- still a high potential of valuable materials in municipal waste
- "dry recyclables bin": packaging material as well as non-packaging material
- goal: recycle both material streams in an efficient way

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"Ideal" Content of a Recycling Bin

- "equivalent" non-packaging materials made out of metal or plastic material should be included
- wood, rubber, textiles or batteries should not be included
- electrical and electronic equipment will not be included in a first step

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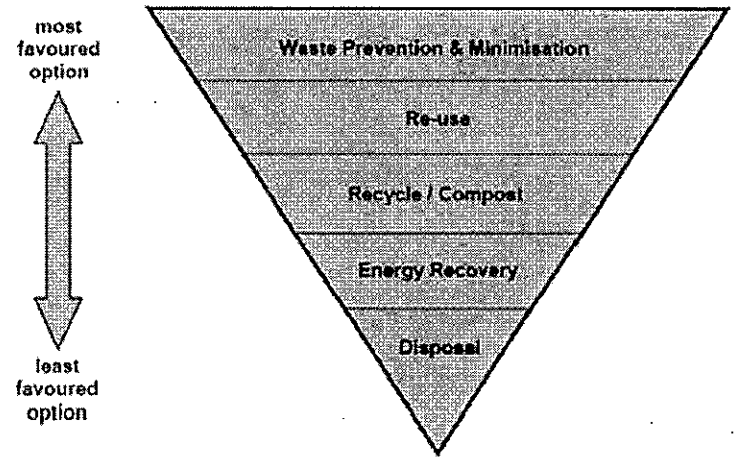
Energy efficiency of material recycling and energy recovery of selected waste fractions

Klaus Fricke, Tobias Bahr, Timo Thiel

Waste management in EU and Germany

The Waste Hierarchy



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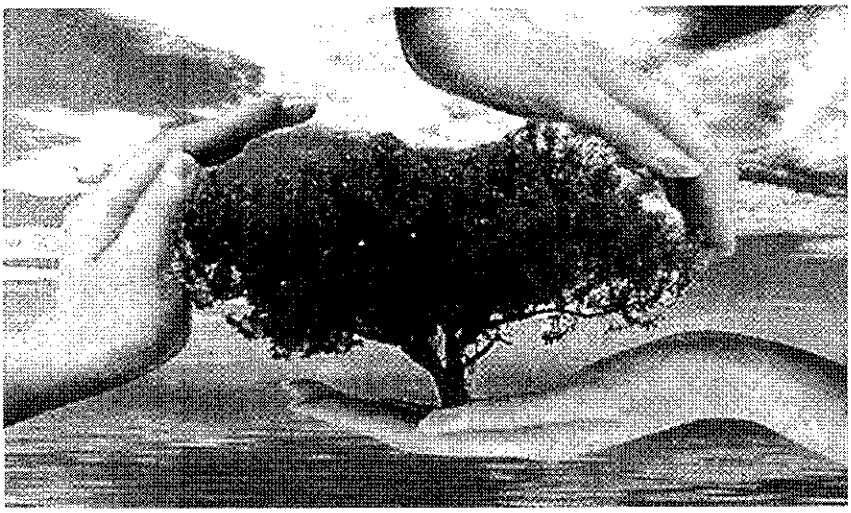
What is the Most Sustainable Strategy?



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Ecology

What is the Most Sustainable Strategy?

Material Recycling or Energy Recovery or disposal

?

....in terms of

- **Ressource efficiency**
- **Environmental protection - Climate chance effects**
- **Economy efficiency**

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Energy Saving – Paper and Cardboard Material Recycling versus Energy Recovery

Cumulated energy demand of primary raw materials	**35 MJ/kg**
CED of equivalent paper made from waste paper	**15 MJ/kg**
Energy saving by material recycling	20 MJ/kg
Net calorific value of paper and cardboard	**13.2 MJ/Kg**

Energy efficiencies currently reached in waste incineration (GER) plants between

- minimum 21%
- maximum 76%
- average 45%

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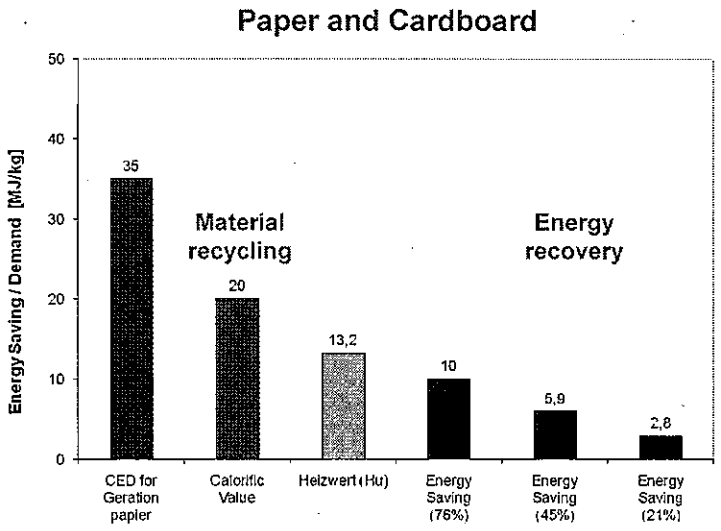
Energy Saving – Paper and Cardboard Material Recycling versus Energy Recovery



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CED = cumulated energy demand

Energy Saving – Plastic (LD-PE)
Material Recycling versus Energy Recovery

Cumulated energy demand of primary raw materials	**68 MJ/kg**
CED of equivalent polymer made from waste plastic	**15 MJ/kg**
Energy saving by material recycling	53 MJ/kg
Net calorific value of plastic	**43 MJ/Kg**

Energy efficiencies currently reached in waste incineration (GER) plants between

- minimum 21%
- maximum 76%
- average 45%

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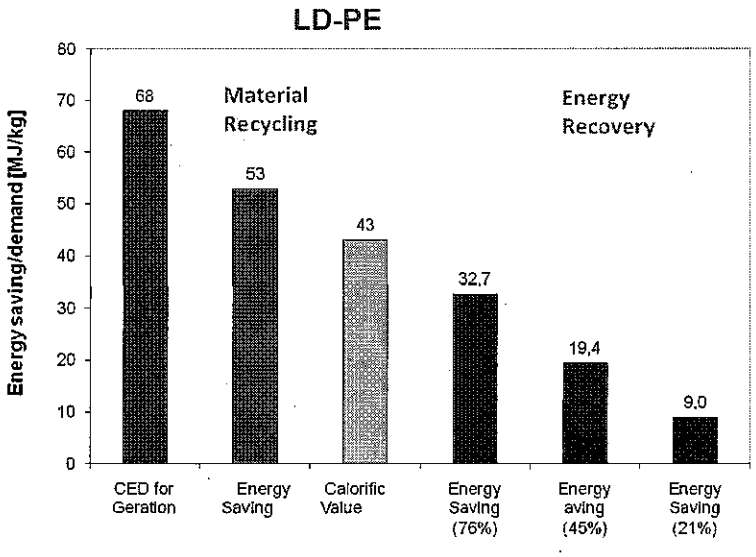
Energy Saving – Plastics e.g. LD-PE
Material Recycling versus Energy Recovery



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Cumulated Energy Demand for Polymergeneration a Corresponding Calorific Vaue

Cumulated energy demand (CED) for polymergeneration		Incineration enthalpy / calorific value
LD-PE	68 MJ/kg	43 MJ/kg
Polystyrol	79 MJ/kg	40 MJ/kg
Polyamid-6	166 MJ/kg	28 MJ/kg
PP	72 MJ/kg	43 MJ/kg
PVC	51 MJ/kg	18 MJ/kg

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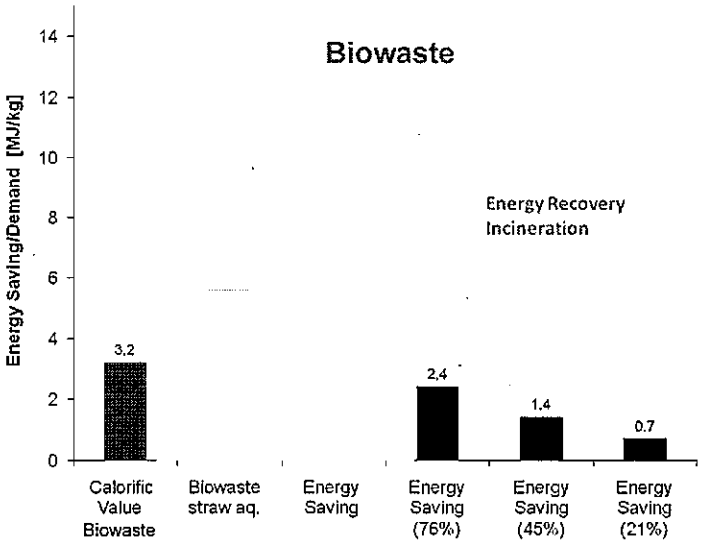
(Source: Kindler und Nikles, 1979 HTP und IFEU, 2001)

Energy Saving – Biowaste Incineration



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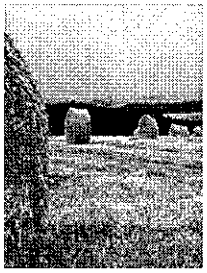
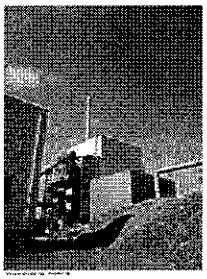
Balancing Humus in Farmland – Compost substitute Straw

In Germany, straw is one of the most important substances (50%) for balancing humus in farmland.

Biowaste Compost could be used to substitute straw for the purpose of humus regeneration...



...straw could be utilized as a regenerative energy source...



....in biomass power plants

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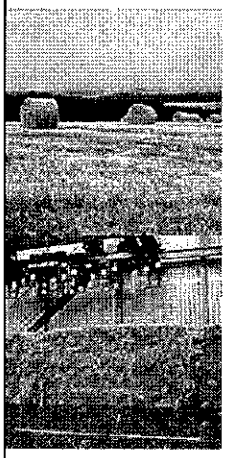
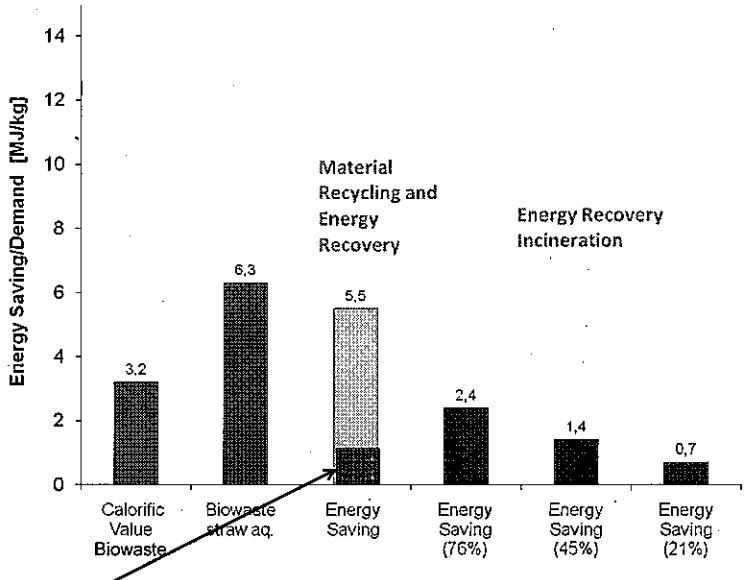
Energy Saving – Biowaste Compost as Straw Substitut Material Recycling in Combination with Energy Recovery





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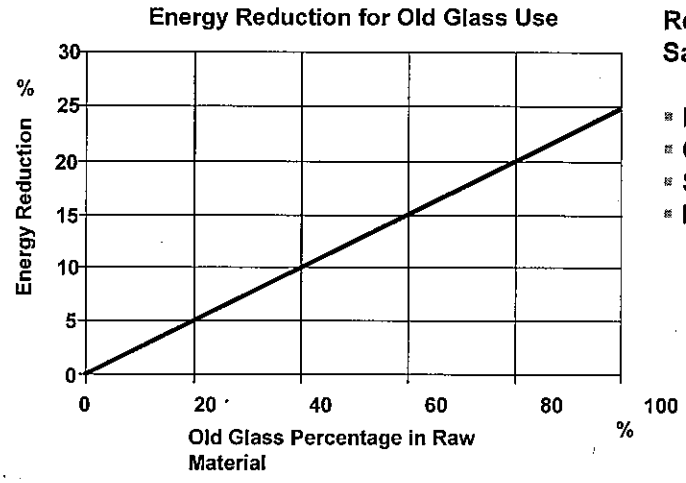
Energy saving - Glass



Resource Savings:

- Energy
- Quartz Sand
- Soda
- Lime

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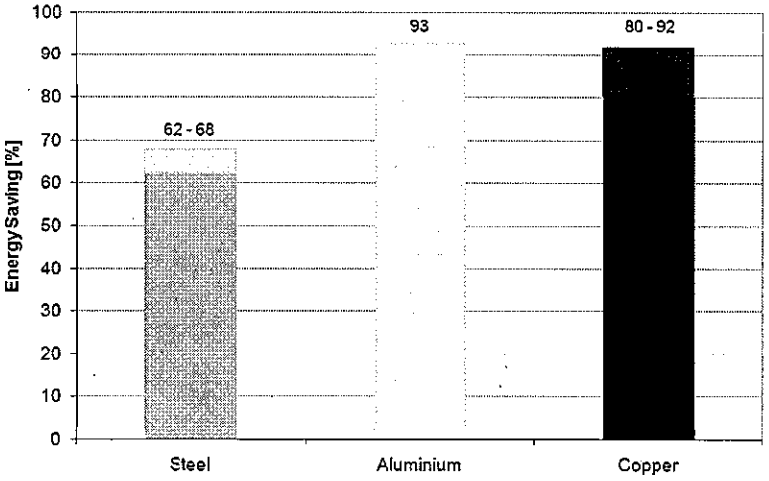
With increased use of old glass the melting point is reduced

13

CEDs for the Production of Selected Metals from Primary and Secondary Rawmaterials



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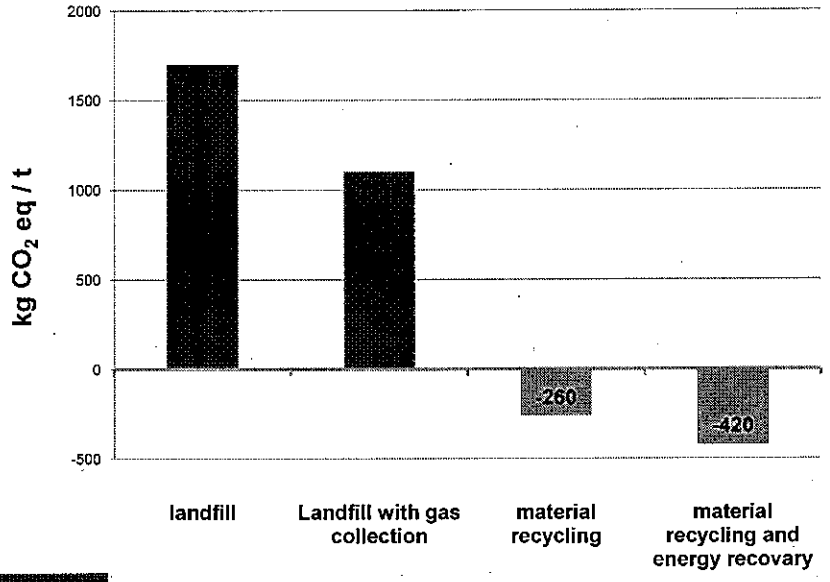
GHG-Emission Reductions by Means of Material Recycling and Energy Recovery



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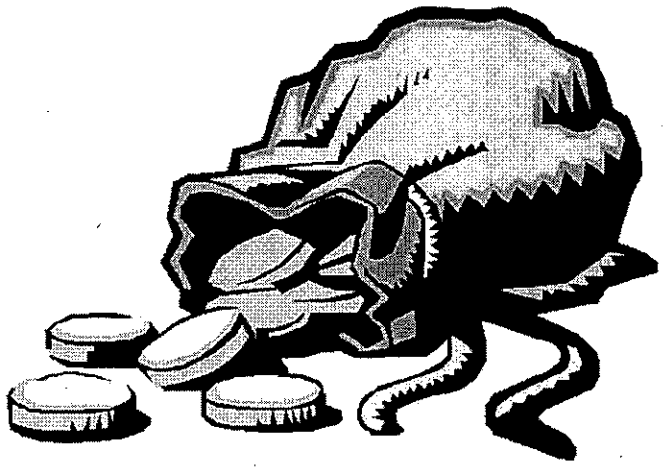
8-12 % of GHG-Emissionen are generated by landfills!!!!

Economy



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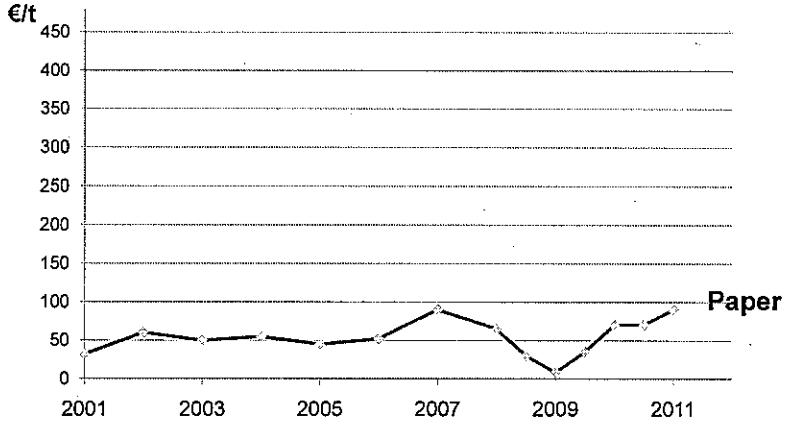
Development of Revenues - Paper



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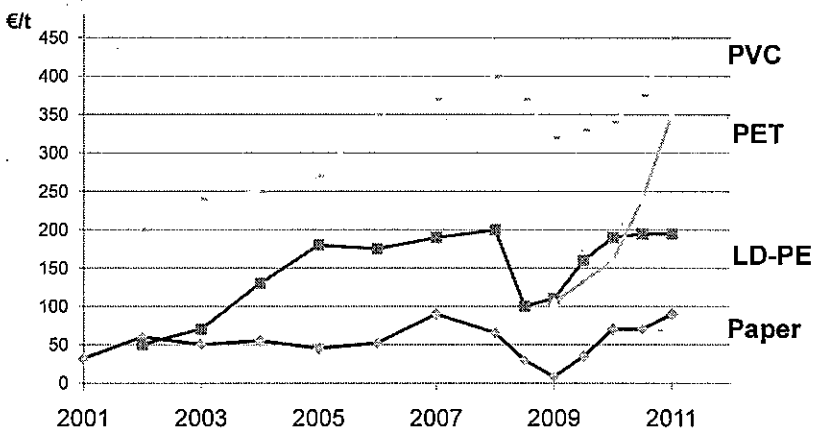
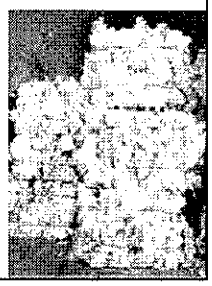
Development of Revenues - Paper and Plastic





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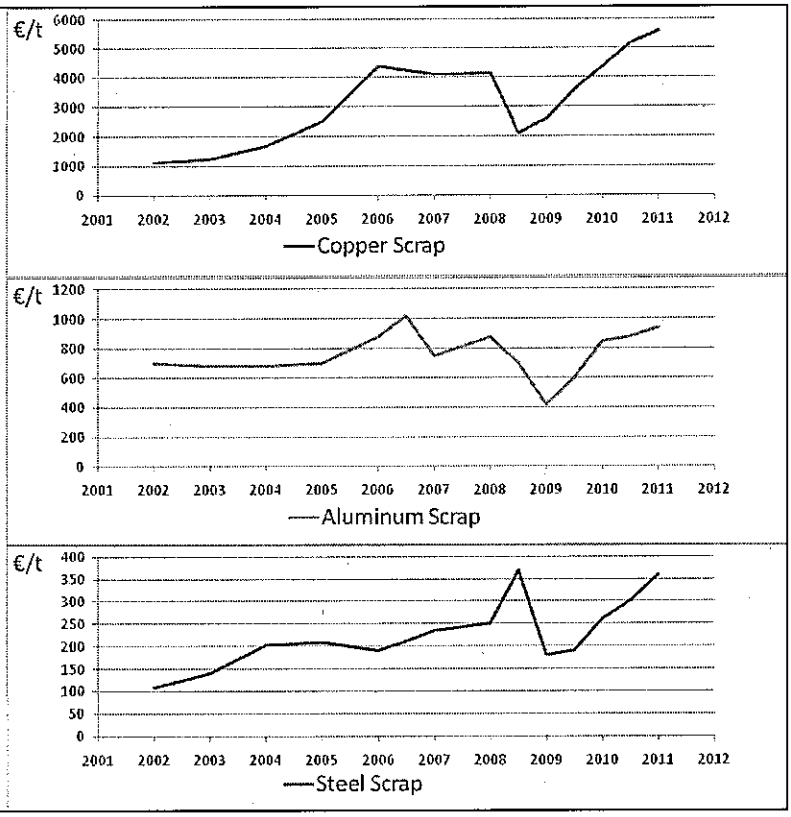
(Quelle: EUWID: 02.2011)

Development of Revenues – Metals



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(Source: EUWID: 02.2011)

Need for Compost

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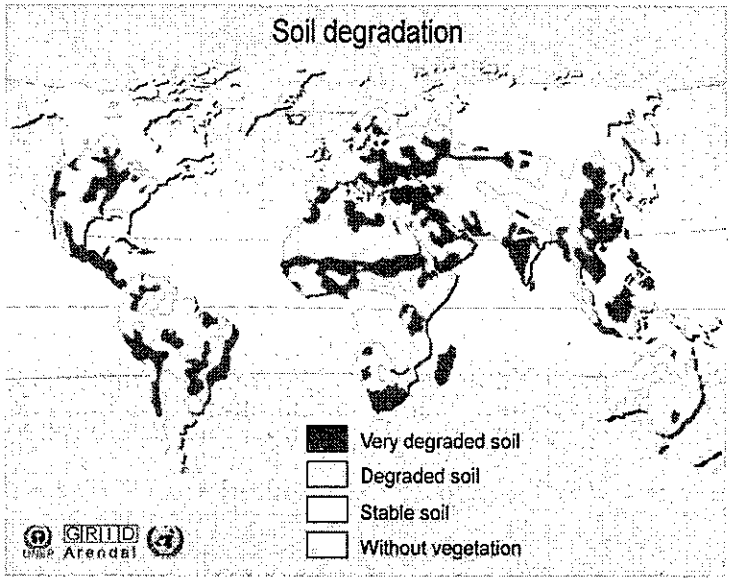
Need for Compost



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e.g.:Protection against soil erosion and degradation by using compost

Need for Compost

e.g.: Water saving due to Increase of waterholding capacity in arid zones by using compost

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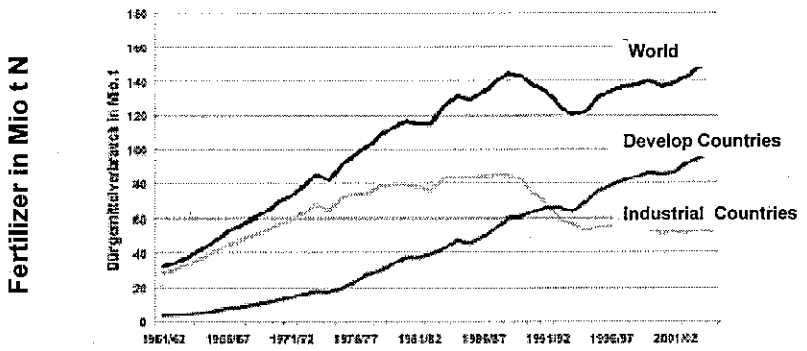
Need for Compost

Development of Demand Fertilizer



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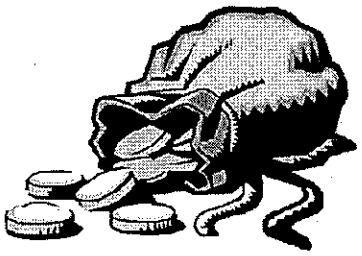
e.g.: Supply organic fertilizer and soil conditioner by using compost

Revenues for Compost



Revenues of Compost

- **Java[1] 30 – 50 €/t**
- **Bali [1] 35 - 45 €/t**
- **Phnom Penh[1] 25 - 40 €/t**
- **GER up ton 50€/t**

6 € /t (avarage)

.....Prices for fertilizers rise

But: Markets for compost-products are not astablished!!!!!!

➡ Calculate carefully (conservativ)

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[1] mainy produced from greenwaste, gardenwaste

Revenues Biowaste System

Financing the operating costs:

• Revenue from Compost	0 - 50 € / t FM Compost 0 - 20 € / t Biowaste
• Revenue from Biogas	6 - 7 € / t FM Fermenter-input
• Revenue from Biogas (+ financial funding by EEG)	15 - 28 € / t FM Fermenter-input
• Revenues CDM	3,7 - 8,2 € / Biowaste

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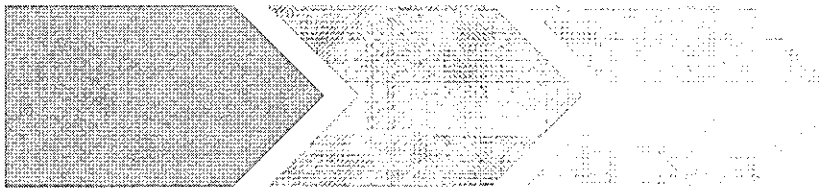
Self-Sustaining Waste Management - Careful Forecasting

wood
metals
paper and cardboard

glas
plastic

biowaste incl. energy-production



2011 2015 ?????

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Summary

- **Regarding resource efficiency, material recycling shows significant advantages compared to energy recovery and disposal (Paper, Plastics, Biowaste etc.)**
- **Higher energy efficiency corresponds to lower climate effects (CO_2-Emissions)**
- **Currently revenues for secondary recourses are high - in the medium term, it can be expect that**
  .....revenues for secondary resources will rise significantly!!!!

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Conclusion 1

Step 1: Improve material recycling by means of

- upgrading separate collecton
- establishing assorting facilities

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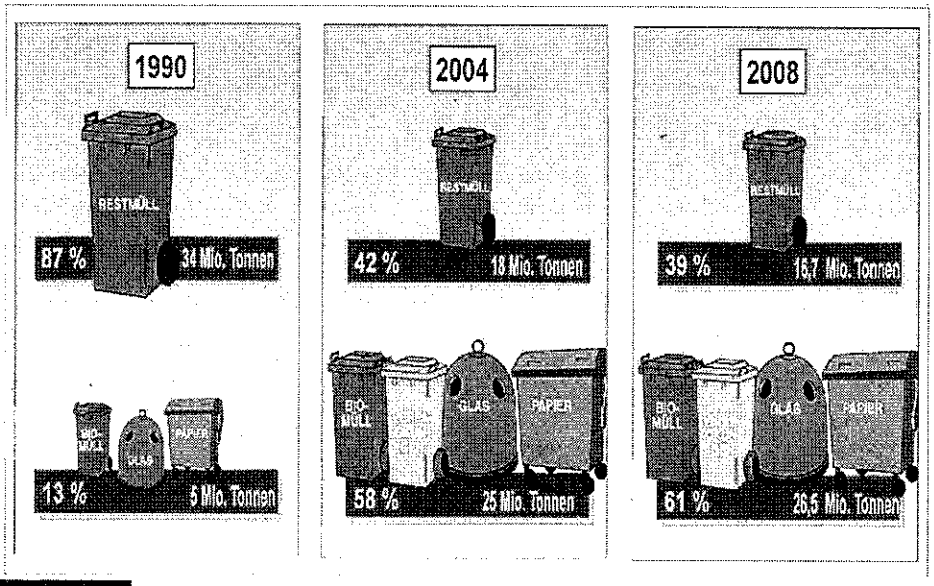
Material Recycling in Germany
- Recycling Rates of separate collection systems



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Conclusion 1

Step 1: Improve material recycling by means of

- upgrading separate collecton
- establishing assorting facilities

In Germany and EU, the high recycling rates would not have been reached without regulatory instruments
- **obligation for separate collection**
- **minimum quota for collection rates**
- **requirements on product quality**

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But!!!!!

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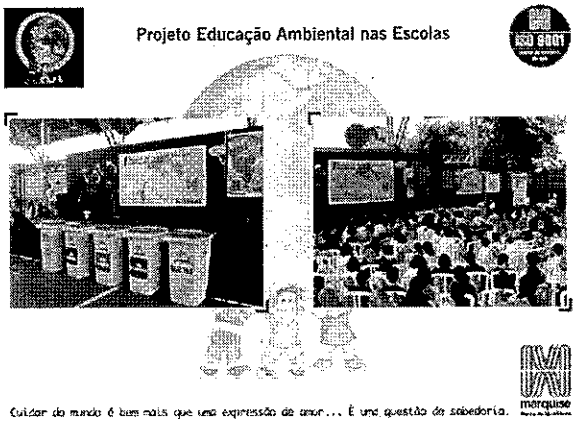
Education and PR-Work

Separate collection needs properly informed and prepared citizens!!!!



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Without well informed and motivated citizens, separate collection wouldn't work

Conclusion 2

Step 2: Increase energy recovery of the remaining non-recyclable waste (30 - 50%)

- Waste incineration, with or without prior treatment in MBT plants
- Production of RDF
- Increase energy efficiency of these plants in order to maximize the effective energy gain

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Summary and Conclusion 3

Step 3: Prevent waste deposition without pre-tratetment

- MBT with integrated Incineration process (biodegradable and wet components)

and /or

- Incineration with high energy efficiency (waste with high calorific value)

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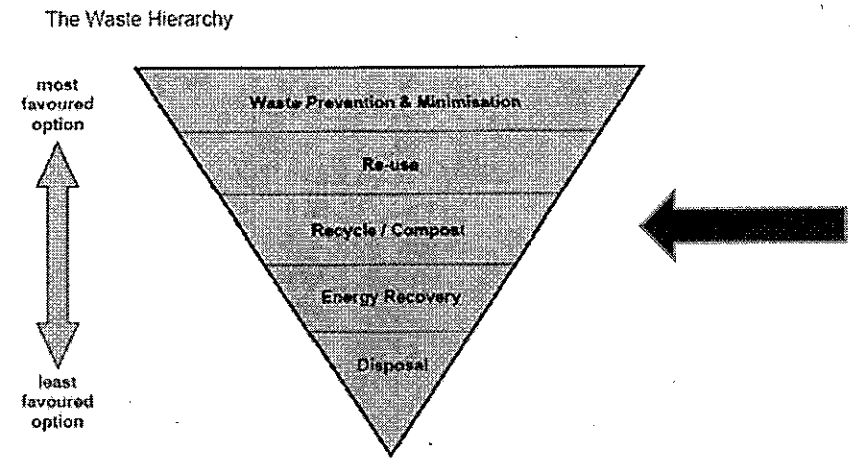
Waste management in EU and Germany



EU-Framework Directive on Waste - 50% recycling rate
German Recycling Law (bill) - 65% recycling rate

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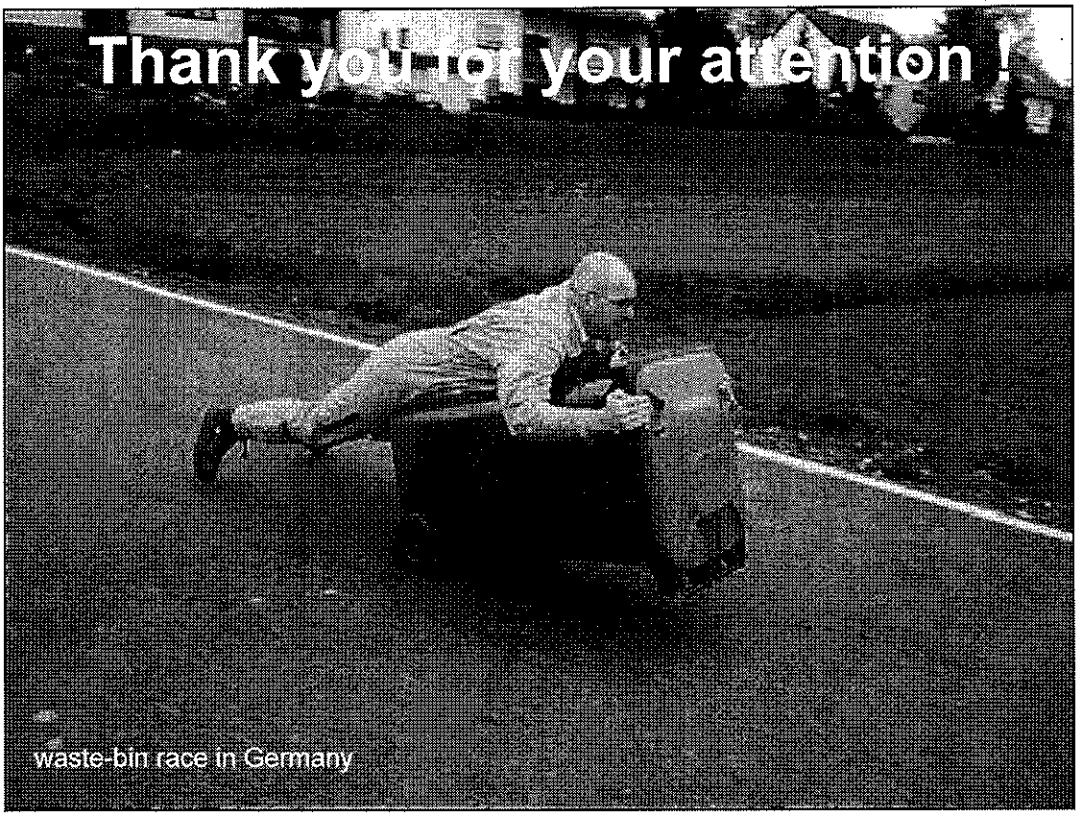


Survey and Analysis of Knowledge, Attitude, and Behavior in Waste Management of the General Public in Taiwan

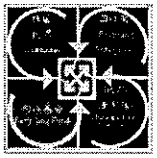

Shin-Cheng Yeh[1]*
T. F. Cheung[2], Y. C. Chien[2]
1: Professor and Director, 2: Graduate Student
Graduate Institute of Environmental Education
National Taiwan Normal University
Taipei, Taiwan

Waste Management in Taiwan

- 36 thousand km^2
- +2.3 million people
- Blooming industrial and commercial activities in last decades
- Collection and treatment of MSW were headaches of the general public and government in the 1980's and 1990's.

Brief history of MSW treatment (1)

- 1997: "Four-in-one recycling" program, lunched by EPA, integrating
  - Community residents
  - Recycling business
  - Local government
  - The Recycling Fund



- Results:

per-capita MSW clean-up amount	1.135 kg ↘	0.501 kg ↗
recycling ratio	3.96 %	37.35 %

Brief history of MSW treatment (2)

- 2005: Two-stage compulsory garbage sorting policy for MSW was implemented in all counties and metropolitan areas:
  - MSW needs to be sorted into resources, food waste, and garbage for being able to be collected.
  - One of the key policies implemented in these years.
- Changes were very clear!

Garbage	Dropping by 14.15%
Recycled matters	Increasing by 51.36%
Food waste	Increasing by 90.35%

Brief history of MSW treatment (3)

- Three key policies in these years:
  - Waste minimization at the sources
  - Compulsory garbage sorting
  - Scope expansion of waste recycling
- Major guidelines:
  - Sustainable resource use
  - Green consumption
  - Green production
  - 3R's
- Ultimate goal: ZERO WASTE

What makes MSW policies successful?

⇨ *Cooperation of the general public*

High buildings in Taiwan

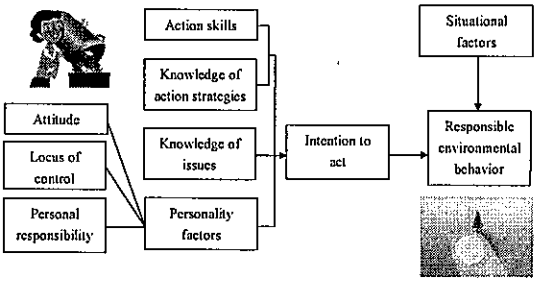
Working with the building administrators

Objectives of this study

- Understand the knowledge, attitude, and behavior in waste management of the general public after 14 years of endeavors to minimize waste.
- Identify the factors influencing the variables.
- Identify and propose potential strategies to promote the performances of the policies.

Use of behavior science models

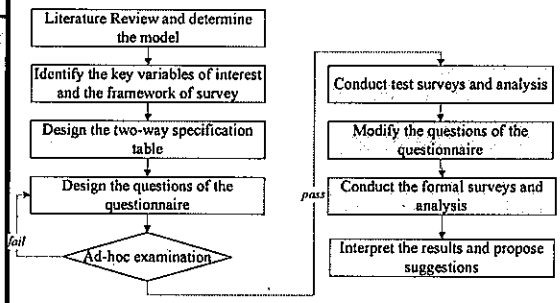
- The Model of Responsible Environmental Behavior (MREB) proposed by Hines (1987) was employed as the analytical model



The philosophy of MREB

- "Intention to act" is the driving force of responsible environmental behavior
- "Knowledge of issues", "Knowledge of action strategies", and "Action skills" are the key premises of "Intention to act".
- "Personality factors" determine the desire to act, which is composed of "Attitude", "Locus of Control", and "Personal responsibility".

Steps of conducting the survey



Developing the two-way knowledge specification table of the survey

Basic knowledge about MSW management	Classification of MSW	#1
	Classification of recyclable matters	#2
	MSW treatment	#3
Advanced knowledge about MSW management	Misconception about MSW management	#4, #5, #9
	Environmental impacts of MSW	#7
Knowledge about the action strategies of MSW management	Governmental Corresponding strategies	#6
	Personal corresponding strategies	#8

Developing the two-way Attitude specification table of the survey

Sensitivity toward MSW management	Alertness about MSW management	#10, #11
	Concern about MSW management	#12
Value toward MSW management	Attitude toward the environmental impacts of MSW	#13
	Attitude toward the policies and laws/rules of MSW management	#14
	Sense of responsibility	#15
Locus of control related to MSW management	Internal locus of control	#15
	external locus of control	#16

Developing the two-way behavio specification table of the survey

Take environmentally friendly actions	Delivery of knowledge	#17
	Persuasion	#18
	Consumption and MSW management	#19, 21
	Public participation	#20
Intent to act related to MSW management	Reduction	#22
	Reuse	#24
	Recycling	#23

Developing the two-way specification table of the survey

Situational and demographical factors

Situational factors	Reasons for recycling	#25
	Opinion on MSW management	#26
	Source of information	#27
Demographical factors	Gender	#28
	Age	#29
	Education	#30
	City/region of residence	#31
	Residence status	#32

The questionnaire

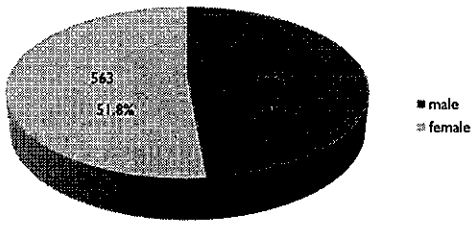
CONDUCTING THE SURVEY...

Basic information of the survey

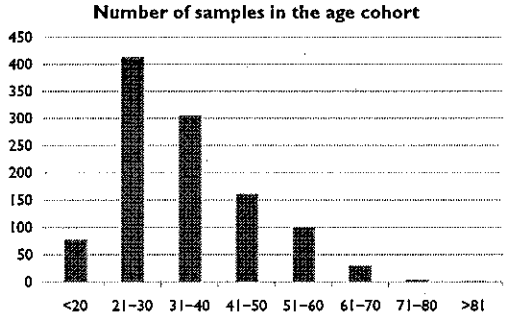
- Cluster sampling was used to determine the sample numbers in counties/cities and regions around Taiwan.
- 1,200 questionnaires were distributed to 15 counties/cities in North, Central, South, and East Taiwan.
- The survey was conducted from February to April, 2011. 1,125 questionnaires were answered and among them 1,104 were effective.

Description of the sample (1)

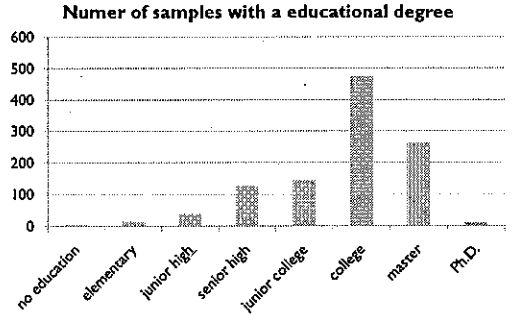
Gender distribution



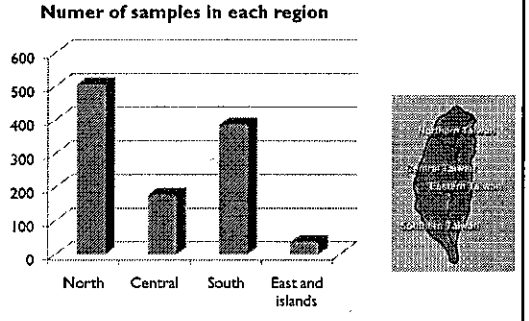
Description of the sample (2)



Description of the sample (3)



Description of the sample (4)

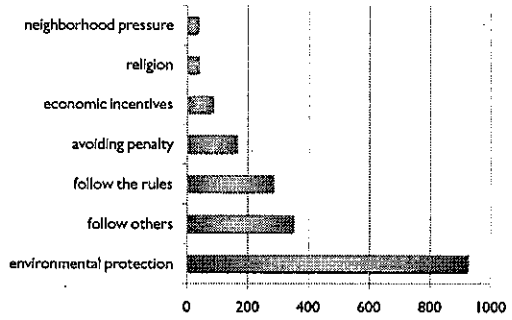


Situational factors (1)

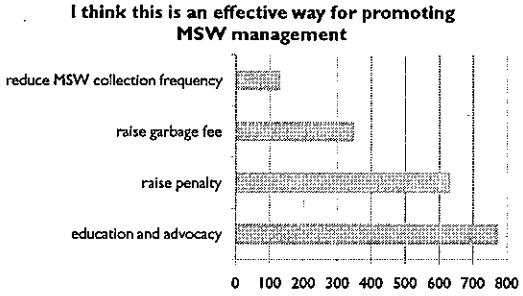
The major way of releasing MSW

Release when garbage trucks arrive	812	73.5%
Collected by the community or building	245	22.2%
Transport to collection sites by myself	44	4.0%

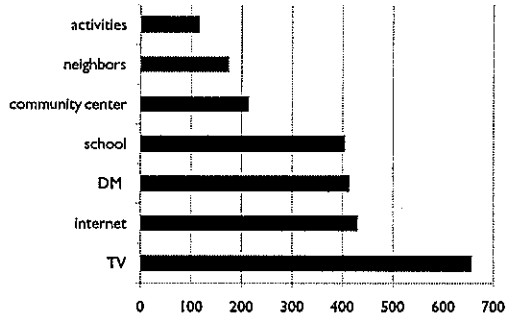
Situational factors (1)
Reasons for recycling



Situational factors (2)
Opinion on MSW management



Situational factors (3)
Source of information



Cross analysis of situational and demographical factors

- T-tests were conducted to examine whether people's situational factor relate to their demographical factors.

Correlations between the situational and demographical factors

Reasons for recycling	**		***	*
Opinions on MSW management	**	**	***	
Source of information	***	***	***	***

Selected statistical significances (1)

- People with master and Ph.D. degrees tend to do recycling because of environmental protection.
- More people in the East do recycling because of environmental protection; whereas more in the North because they want to abide by the rules set by the government.
- Older people think education and advocacy can promote MSW management performance; younger people think raise of penalty is effective.

Selected statistical significances (2)

- People with higher educational degrees agree with that raise of garbage fee is effective.
- Males get information related to MSW management more from TV and internet; whereas more females get information from DM, school, community centers, and activities.

KNOWLEDGE, ATTITUDE, AND BEHAVIOR

Results about knowledge

- The average score is 4.8 out of 8.0. (4.8/8.0 = 60/100)
- Q#7 is the question with the highest correct percentage (97.1%). Most people understand batteries need to be recycled to avoiding release of toxic chemicals into the environment.
- Q#5 is the questions with the lowest correct percentage (9.7%). Most people think that building more incinerators can solve the problem of growing garbage amount.
- Only 45% know wax papers cannot be recycled.

Grouping and cross-analysis

- Questions for knowledge were classified into four categories: waste reduction, waste collection, and waste treatment, and recycling.
- For each knowledge category, t-tests were conducted with respect to each of the demographical factors.

Selected analysis results

- Older people (>61) got higher scores for recycling.
- Education is not a significant factor for knowledge.
- People in the East and North understand better in waste reduction. People in the Central and South understand better in waste collection.

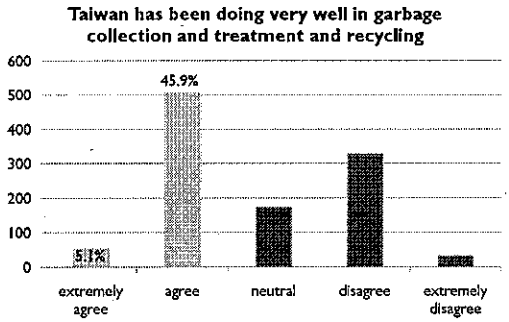
Results about attitude

- Using the 5 point Likert Scale to quantify the people's attitude toward MSW management.
- The average score is 3.65, indicating that in general people have a positive attitude toward MSW management.

Selected results (1)

- 51% agree with Taiwan has been doing very well in garbage collection and treatment and recycling.
- 84.6% don't want a near-by incinerator or landfill but 90% think building more incinerators is a effective way for growing garbage amount.
- 88.5% agree with the "No-ground-touch" MSW collection policy.

Selected results (2)



Grouping and cross-analysis

- Questions for attitude were classified into four categories: concern, viewpoint, sense of responsibility, and locus of control.
- For each attitude category, t-tests were conducted with respect to each of the demographical factors.

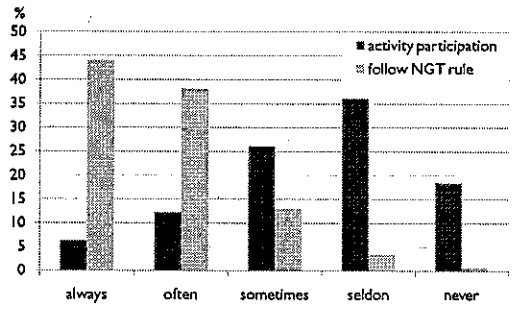
Selected analysis results

- Females concern about waste treatment issues more than males. Females have stronger locus of control than males.
- Older people have stronger concern, viewpoint, and sense of responsibility than younger people.
- People with more years of education have stronger viewpoint, locus of control then people with less years of education.

Results about behavior (behavioral intention or intention to act)

- The average score using the 5 point Likert Scale is 3.78, indicating in general people have a positive intention to act in terms of MSW management.
- The scores for communication and persuasion are relatively less than the scores of other questions about behavior, showing the cultural characteristic of not tending to actively communicate with others.

Comparison between "activity participation" and "following rule"



Cross-analysis

- Females have stronger intention to act than males in public participation.
- Older people have stronger intention to act than younger people.
- People with fewer years of education tend to act more than people with higher education.

Interrelationships among knowledge, attitude, and behavior

- Knowledge does not have significant relationships between either attitude or behavior.
- Attitude has significant relationships with behavior.

Discussion

- People have good performance in knowledge related to MSW management, but some misconceptions do exist.
- About half people (51%) give a positive evaluation to the MSW management work in Taiwan.
- People living in different regions do have different ideas in many things related to MSW management.

Policy suggestion

- Diversified strategies for education and advocacy in MSW management can be set for people according to their age and region of residence.
- Attitude improvement will result in better behavior. Thus, environmental education activities emphasizing value is of major importance.
- Enforcement and accompanying raise of penalty are effective way for promoting the performance of MSW management.

Thank you very much!

Hong Kong's Waste Management Challenges

Dr. Alain Lam
Environmental Protection Department
HKSAR Government

5 May 2011

Overall Waste Situation

Solid Waste in Hong Kong

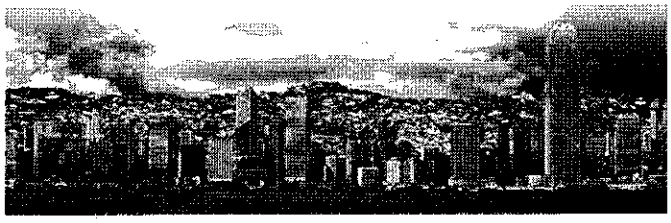
- Municipal Solid Waste (MSW)
  - Domestic waste
  - Commercial and industrial waste
- Construction Waste
- Sludge
- Other waste
  - *Animal Waste*
  - *Clinical Waste*
  - *Low Level Radioactive Waste*

An everyday problem ...

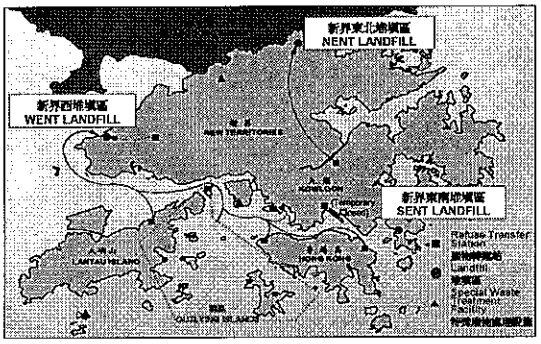
- Hong Kong people generate 18,000 tonnes of MSW everyday of which almost half (49%) are recovered for recycling.

Waste	Tonnes/day
Municipal Solid Waste	9,000 (including 3,300 tonnes of food waste)
Construction waste	3,200
Sludge	900
Other waste	200
Total landfilled	**13,300 tonnes**

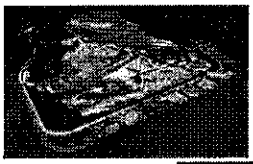
Waste Treatment Modes and Facilities



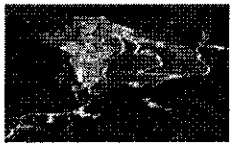
Network of Waste Transfer and Disposal Facilities



Strategic Landfills



Nim Wan, Tuen Mun
(WENT Landfill)



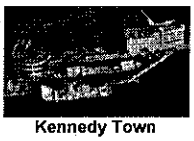
Ta Kwu Ling
(NENT Landfill)

Tseung Kwa O
(SENT Landfill)

Refuse Transfer Stations (RTSs)

Chai Wan

Shatin



Kennedy Town

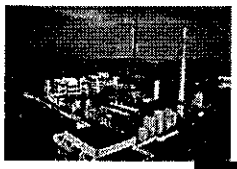
West Kowloon

North Lantau

North West NT

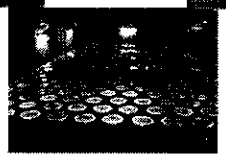
Outlying Islands

Special Waste Facilities



Chemical Waste Treatment Centre (CTWC)

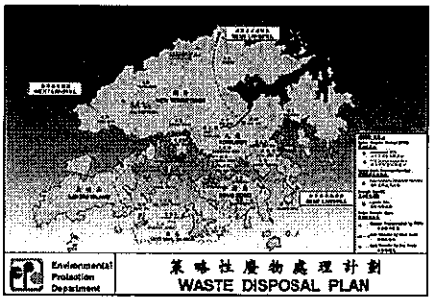
Animal Waste Composting Plant (AWCP)



Low Level Radioactive Waste Storage Facility (LLRWSF)

Handling of Clinical Waste

An imminent problem ...

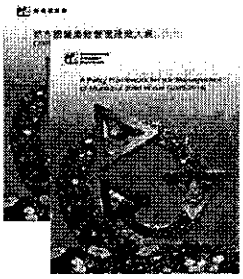


	Anticipated Year of Exhaustion
SENT Landfill	2014
NENT Landfill	2016
WENT Landfill	2018

Timely preparation for proper management

13,300 tonnes
(tonnes / day)

Policy Framework for the Management of Municipal Solid Waste (2005-2014)

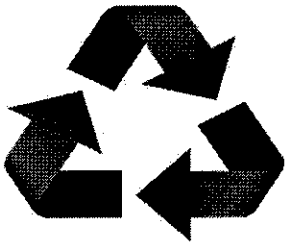


Waste Hierarchy

- Avoidance and minimization
- Reuse, recovery and recycling
- Bulk reduction and disposal

A multi-pronged approach

Reduce & Recycle



Timely landfill extension

Modern facilities for waste treatment

Reduction at Source

Reduce Waste at Source

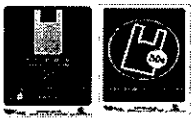
Producer Responsibility Scheme (PRS)

- Manufacturers, importers, wholesalers, retailers and consumers to share the eco-responsibility of reducing, recovering and recycling certain products so as to minimize their environment impact

Reduce Waste at Source

Product Responsibility Scheme (PRS)

- A framework legislation enacted in July 2008 to provide legal basis for introducing PRS's
- The environmental levy on plastic shopping bags is the first PRS under the Ordinance
- The environmental levy scheme commenced on 7 July 2009

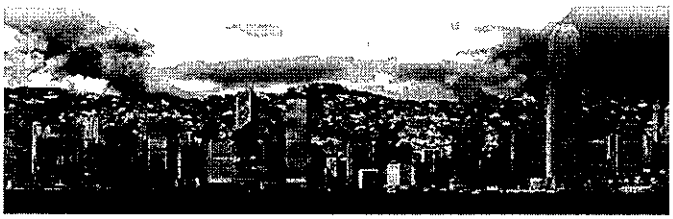


Reduce Waste at Source

Product Responsibility Scheme (PRS)

- WEEE is the next target product for the mandatory PRS
- Consultation documents published on 18 January 2010
- Public consultation ends on 30 April 2010

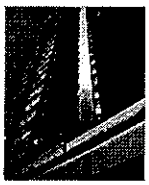
Waste Recycling



Waste Recycling

High Rise Domestic Buildings in Hong Kong

Large private development



Single-block building

Public housing estate

Waste Recycling

Territory-wide Source Separation of Domestic Waste

- Territory-wide programme since January 2005
- 1,600 housing estates signed up with over 80% of the population by end 2010
- Recovery rate of domestic waste increased from 14% in 2004 to 40% in 2010

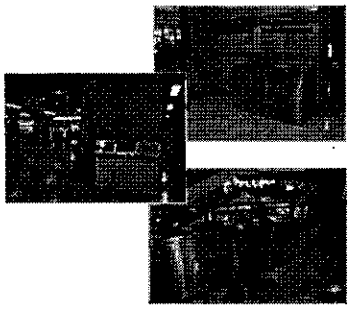
Waste Recycling

Commercial & Industrial Buildings

Waste Recycling

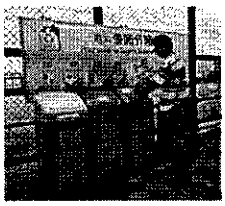
Source Separation of C&I Waste

- Source separation of commercial and industrial waste commenced in Oct 2007
- Encourage property management to arrange waste separation and recovery at source
- Covered 667 buildings by end 2010



Waste Recycling

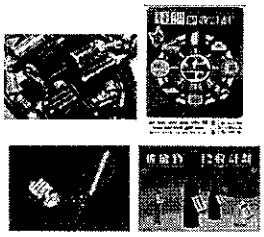
- 42,000 waste separation bins placed throughout Hong Kong
- Recruit housing estates and buildings to join the Programme on Source Separation of Waste
- In 2009, the recovery rate for municipal solid waste reached 49%



Waste Recycling

Voluntary PRS Programmes

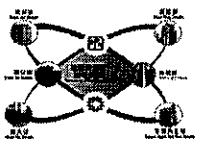
- Rechargeable Battery
  - Launched in 2005
  - Recovered 990,000 pieces
- Computer
  - Launched in Jan 2008
  - Recovered 33,200 pieces
- Fluorescent Lamp
  - Launched in March 2008
  - Recovered 488,000 pieces
- Glass Bottle from Hotel
  - Launched in Nov 2008
  - Recovered 460 tonnes



Waste Recycling

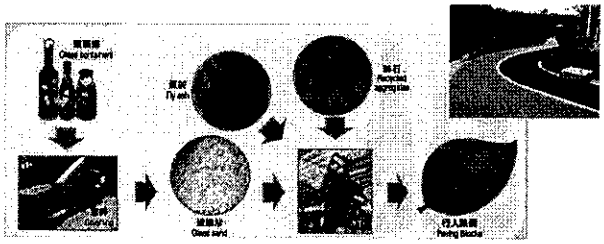
Pilot Programme on Source Separation of Glass Bottles

- A 12-month Pilot Programme on Source Separation of Glass Bottles was launched in December 2010 at six public rental housing estates in East Kowloon.
- Glass recycling bins are provided alongside the existing 3-coloured waste bins to facilitate separation of glass bottles for recycling.



Waste Recycling

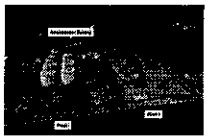
Glass Bottle Recycling



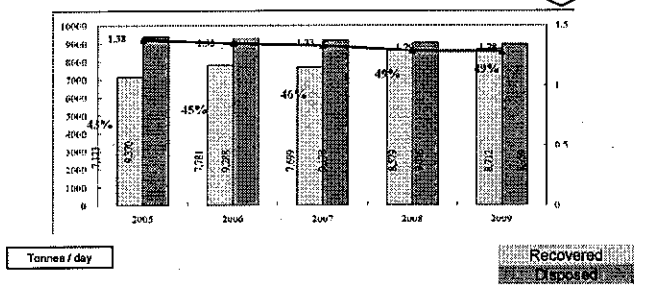
Waste Recycling

EcoPark

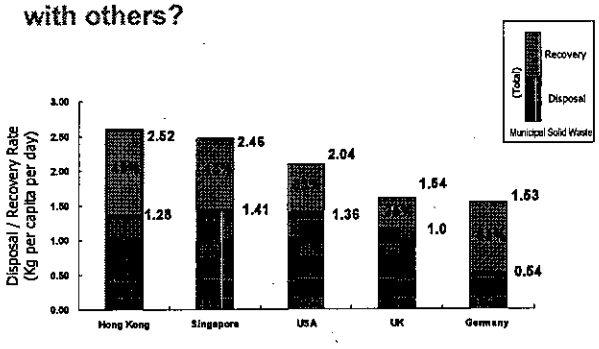
- Located in Tuen Mun Area 38
- To provide long-term land to support local recycling and environmental
- All six lots in Phase I have been let out for the recycling of waste cooking oil, metals, wood, computers, car batteries and waste plastics
- For Phase II, the site formation and road works have been substantially completed and the lots will be available for leasing by in mid 2011



Gradual growth in recovery rate



How does Hong Kong compare with others?



Reduce & recycle

What we will do next .....

- Raise reduction target to 55% by 2015
- Step up provision of recycling facilities
  - on-site food waste treatment facilities at housing and commercial property
- Launch community-based campaigns
  - build recycling network at 18 districts to promote collection of reusable/recyclable materials
  - leverage on network of frontline Government departments to promote waste reduction

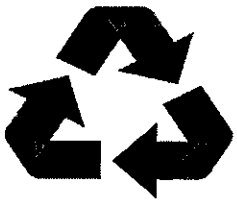
Reduce & recycle

What we will do next .....

- Implement producer responsibility schemes (PRS)
  - Plastic shopping bag levy phase II
  - Waste electrical and electronic equipment PRS
- Launch public consultation on Municipal Solid Waste (MSW) charging

A multi-pronged approach

Reduce & Recycle



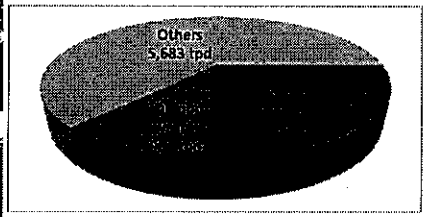
Timely Landfill Extension

New Waste Treatment Facilities

Introduce modern waste treatment facilities

Sludge treatment facility	2,000 tonnes	2013
Integrated waste management facility (IWMF)	3,000 tonnes	2018
Organic waste treatment facility (OWTF)	Phase I : 200 tonnes	2014
	Phase II: 300 tonnes	2016/17

Food Waste is a main constituent of Municipal Solid Waste



In 2009, ~3280 tpd food waste disposed of at landfills

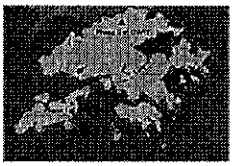
Organic Waste Treatment Facilities (OWTF)

Objectives

- Recover resources (e.g. energy, compost) from organic waste (e.g. food waste)
- Stabilize organic waste and reduce landfill disposal

Plan

- Develop OWTF in two phases
- Each phase of 200 tpd capacity for source separated food waste from the commercial & industrial sectors
- Phase 1 in Siu Ho Wan, North Lantau (to be commissioned before mid 2010's)
- Phase 2 in Sha Ling, North District



A multi-pronged approach

Reduce & Recycle

Timely Landfill Extension

Modern Facilities For Waste Treatment

Timely extension of landfills

- To handle three types of wastes including :
  1. Wastes not treated by IWMF due to capacity constraint
  2. Wastes that cannot be incinerated, e.g. construction waste
  3. Ashes remaining from the wastes treated by IWMF

Key milestones for waste management

Today	2015	2016/18
■ Recovery rate at 49%	■ Recovery rate at 55%	■ Recovery rate assumed unchanged
■ Recycling facilities cover 80% of population	■ Other PRS kicks in	■ Other PRS continues to be implemented
■ Plastic shopping bag levy Phase I in place	■ Sludge treatment facility in operation	■ Phase I of IWMF in operation
	■ Phase I of OWTF in operation	■ Phase II of OWTF in operation
13,300 tonnes (tonnes / day landfilled)	**11,500 tonnes** (tonnes / day landfilled)	**8,500 tonnes** (tonnes / day landfilled)

Lai ying-ying

寄件者: "Letecia Maceda" <lettymaceda@yahoo.com>
收件者: "Lai ying-ying" <yylai@sun.epa.gov.tw>
傳送日期: 2011年5月21日 上午 10:31
主旨: REPLY

Dear Lai ying-ying,

Its nice to hear from you. Im happy you give time to send me a message. How are you? I am really interested in your presentation, Status and Policy of MSW Reduction and Recycling in Taiwan. How i wish i can share it to my staff here in my region and some of the local governments here. I just hope oneday during one of our summit, you can present it to us. Every year we have a conference on solid waste composed of 200 to 300 participants. Is it possible if you can email me your presentation? Is it also possible that you can be one of the presentor during our solid waste management summit. It is usually held every November. Usually our presentors are local speakers coming from the local government units or from organizations or non government organization with best practices or modern technologies on solid waste management. Thank you and you really had a good presentation. I am actually a regional director of the Environmental Management Bureau of the Department of Environment and Natural Resources in the Visayas region of the Philippines. We can discuss if you want to. Thanks.

Regards,

Letty Maceda

From: Lai ying-ying <yylai@sun.epa.gov.tw>
To: lettymaceda@yahoo.com
Sent: Fri, May 20, 2011 7:39:19 PM
Subject: Nice meeting you at Hong Kong--import and export of hazardous wastes

Dear MS.Leteclar.maceda:

It was nice meeting you at Hong Kong .

We may plan to discuss the proposal of memorandum of agreement about import and export of hazardous wastes with Philippine in the future.
I'm wondered that I could ask you some information about that if you are responsible for the task in your bureau?

Best regards,

Lai ying-ying
EPA Taiwan, R.O.C.
Department of waste management

Lai ying-ying

寄件者: "Angus Ho" <angusho@greeners-action.org>
收件者: <yylai@epa.gov.tw>
副本: "Ying Ying Kwok" <yykwok@greeners-action.org>; "Nevan Siu" <nevansiu@greeners-action.org>
傳送日期: 2011年6月2日 下午 03:58
附加檔案: 20110601_letter_to_EPA_TW_3.doc
主旨: 誠邀出席訪台交流活動

行政院環境保護署
廢棄物管理處副處長
賴小姐,

誠邀出席訪台交流活動

本會是香港的環保團體綠領行動，閣下於5月5日來香港灣仔會議展覽中心演講的時候有碰面過，對於閣下的演講留下深刻的印象，我們很欣賞台北在減少廢物方面作出的努力，尤其是2000年實施的「垃圾費隨袋收費制」，成效顯著，很多減廢政策都走得比香港快。綠領行動於過去10年一直致力推動香港的減廢運動，我們於2006年成功舉辦無膠袋日，於2009年成功促請香港政府推行膠袋徵費計畫，近年更積極推動工商業以及家居於源頭減少產生廚餘及回收廚餘作堆肥或飼料。

台灣的環境保護工作向來完善，一直被外界公認爲觀摩取經的對象。本會將於8月8日至8月12日帶領一班香港的學生到台北交流，其間希望能於8月9日下午大約2pm至4pm到訪 貴署，瞭解 貴署減廢工作的經驗，如垃圾源頭減量計畫及垃圾費隨袋徵收等，當地居民對政策的反應和參與的情況，從而反映出香港對環境保護工作的落後。同行的學生是參與本會舉辦的Make it Green 環保產品設計大賽的得獎者，對環保充滿熱誠及認識，此行我們也會參觀垃圾焚化廠、垃圾清運點、電子廢物處理廠等，讓同學更深入瞭解台灣的不同環保政策的利與弊，思考如何將有關經驗借鑒於香港，鼓勵同學將有關環保的小貼士向朋友和家人推廣。

本會殷切希望閣下能撥冗安排是次交流活動，促進兩地環保活動的交流，一起努力締造可持續發展的未來。如有任何查詢，請與本會高級項目主任郭盈盈聯絡(電話+85266551924，電郵yykwok@greeners-action.org)。多謝支持環保工作！

綠領行動總幹事
何漢威 謹啓
2011年6月1日