

Waste Management Policies and Services in Taipei

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Taipei City

Geography and Population



Figure 1: Taipei City

Taipei City is nestled in the Taipei Basin of northern Taiwan, surrounded by Taipei County at its borders. Situated in the subtropical zone, summers of Taipei are characterized by scorching heat and frequent thundershowers, while winters are cold and accompanied by drizzles. Taipei is surrounded by foothills and mountains in the northern, eastern and southern sides. Besides, the city enjoys a rich water system consisting of Tanshui River, Keelung River, and the Jingmei Creek.

The total area of Taipei is 272.14 km², and is divided into twelve administrative districts (Figure 1). 46.56% of the city's total area has been developed. The households in Taipei are getting smaller. Taipei registers a population of 2.63 million, which is roughly 12% of the total population in Taiwan.

Business and Industry Profile

92.3% of businesses based in Taipei belongs to the tertiary industry; namely, commerce, transportation, finance, and service industries. Adding up the population working and living in Taipei, there are more than 3 million people in and out of Taipei everyday, thus a huge amount of trash is generated each day (Table 1).

Table 1: Annual Waste Volume and Average Waste Volume Per Capita Per Day

Yr	Waste Volume Collected by TDEP Team		Waste Volume Collected by Private Operators		Total	
	Annual total (tons)	Average (kg per capita per day)	Annual total (tons)	Average (kg per capita per day)	Annual total (tons)	Average (kg per capita per day)
82	1,298,026	1.34	90,695	0.09	1,388,722	1.43
83	1,302,850	1.35	101,730	0.11	1,404,581	1.45
84	1,234,141	1.28	133,610	0.14	1,367,752	1.42
85	1,260,147	1.32	156,615	0.16	1,416,764	1.49
86	1,193,511	1.26	169,553	0.18	1,363,065	1.44
87	1,030,682	1.07	443,606	0.46	1,474,289	1.53
88	1,069,201	1.11	293,186	0.31	1,362,388	1.42
89	870,993	0.90	333,026	0.34	1,204,020	1.25
90	687,363*	0.71	360,407	0.37	1,047,770	1.08
91	625,487	0.65	285,297	0.30	910,784	0.95

*: Excluding 190,645 tons of trash caused by Typhoon Nari

Due to the dense population and limited spaces in Taipei, the land available for waste disposal is difficult to find. To thoroughly solve the waste problem in Taipei, and at the same time, search for a plan of implementation capable of sustainable development, Taipei City Government (TCG) is undertaking a great deal of improvements in waste management in the past few years.

Current Status of Waste Management in Taipei

Current Status of Waste Disposal and Resource Recycling

Trash in Taipei City is collected through a Off ground curbside pickup system since 1996. Taipei City Government Department of Environmental Protection (TDEP) is currently offering a household waste collection service six days a week. Residents are required to take out the waste to designated locations, at a specific time and dump them in the garbage trucks that arrive on site. In the meantime, we

also offer a recyclable collection program three times a week. Recyclables will be collected by pickups that follow garbage trucks and taken down to the private sorting facility for further sorting and recycling. TDEP has outsourced two private companies for sorting and recycling. Effective manual sorting is capable of handling approximately 120 tons of recyclables per day.

Brief Introduction to Waste Management Facility

Limited by the City's high population and lack of available land space, the City Government initially adopted a waste disposal strategy favoring incineration as the primary treatment method and landfill as secondary. The city currently has three large-scale waste incinerators, the Neihu Plant with installed daily capacity of 900 tons, the Mucha Plant with installed daily capacity of 1,500 tons and the Peitou Plant with installed daily capacity of 1,800 tons. The City's current Shanchuku Sanitary Landfill, opened in June 1994 with an installed capacity of more than 6 million cubic meters, is estimated to reach capacity in 2007. Non-combustible waste, incinerator bottom ashes and fly ashes after solidification

are using landfill as final waste disposal method. Planning and environmental impact assessments are currently underway at the selected site for Taipei City's third sanitary landfill.

Implementation and Progress of Waste Minimization Policy

Per Bag Trash Collection Fee Policy

To achieve waste reduction, Taipei City started with implementing the Per Bag Trash Collection Fee policy. Trash collection fee is used for the disposal of trash. Based on the polluters pay philosophy, all residents should pay to have their trash collected by city crew, and the TDEP certified trash bag is used to measure their trash volume. Residents are required to load the trash in the TDEP certified trash bags before handing over to the collection crews. To encourage recycling, recyclables are collected for free, no need of certified trash bags. In this case, throw less pay less, recycle and save more.

Recent Progress on Waste Reduction

Up to the end of 2002 PBTCH policy has been implemented for 30 months since July 1st 2000. Excluding Typhoon Nari's effect, the average daily waste volume is 2,649 tons (includes household waste volume, waste volume collected by private contractors, yet excludes treated sludge and construction waste), an average of 0.95 kg per capita per day. Compare with 1999 data before implementing PBTCH, the average daily waste volume is 3,695 tons, an average of 1.41 kg per capita per day. Daily waste volume dropped 1,046 tons, and waste reduction rate reaches 28.3%.

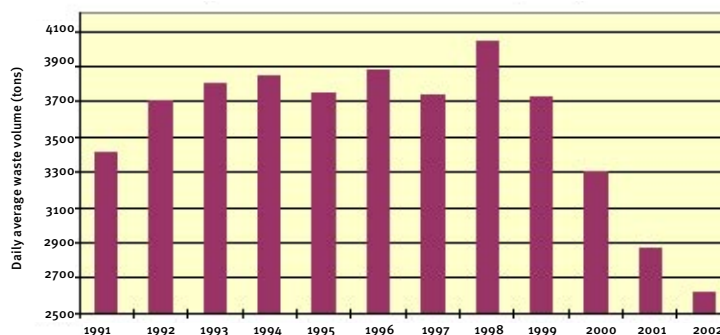
If we specifically look at the household waste volume collected by TDEP collection crews, the average daily waste volume is 1,805 tons, an

average of 0.65 kg per capita per day. Compare with 1999 data again, the average daily waste volume is 2,970 tons, an average of 1.13 kg per capita per day. Daily waste volume dropped 1,165 tons, thus the waste reduction reaches an even higher at 39.2%.

Recent Progress on Resources Recycling

After implementing PBTCH policy, the volume of recyclables increases dramatically up to an average of 153 tons per day, more than 80 tons of recyclables per day, i.e. a 100% increase, were collected comparing with 1999 data. This progress greatly encourages the recycling business. Most apartment buildings, schools and governmental offices tend to sale their recyclables to the private contractors. In order to fully understand the actual situation for the volume of the recyclables, TDEP started to keep track of the volume collected from the private contractors. Statistic shows that the total volume of recyclables collected in 2002 from both TDEP collection crews and private contractors is 19,079 tons, and the total recycling rate is 20.4%. It is obvious that PBTCH strategy successfully reached the goals for waste reduction and resources recycling.

Figure 2: Waste Reduction in Taipei City



Reduction from the Source Program

Currently, there is a portion of trash generated that can be eliminated simply through consumer choices. The Per Bag policy provides an economic

incentive for consumers to select products, which generate less trash. At the same time, another portion of trash generated can only be eliminated by requests from manufacturers or retailers. TCG is actively working with central government EPA in promoting Restricted use of plastics bags and disposable products program to reduce waste from the source. It is estimated to cut down the usage of plastic bags by 31% and plastic (Styrofoam) utensils by 37%. The usage of plastic raw material is estimated to reduce approximately 36,000 tons in Taiwan, in which 15% is consumed by Taipei.

Beginning last July, plastic bags (i.e. thickness less than 0.06mm) and disposable products were no longer provided at governmental offices, schools, publicly owned businesses and military organizations. And starting this year, department stores, wholesales, supermarkets, convenient stores, fast food chain stores, and restaurants joined in. Just before the date of start to crack down the violators, a poll results shows that except for restaurants with compliance rate of roughly 50%, all others reached remarkably over 90%. Such terrific outcome is testimony to the power of environmental awareness.

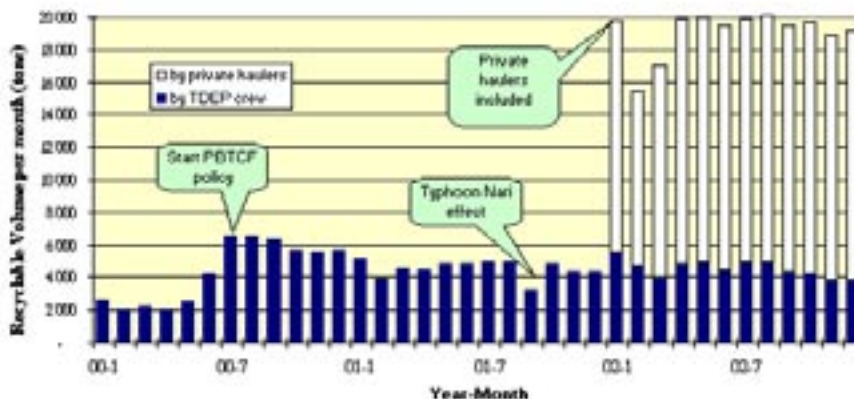
Green Procurement Program

Green Procurement aims at helping governments achieve their environmental policy goals while meeting their budget lines. By investing in environmentally and economically sound products and services, thus avoiding unnecessary follow-up costs, public institutions can save significant amounts of money. At the

same time, they contribute to a healthy and sustainable environment by reducing their direct environmental impact significantly, and by exerting a model function towards other consumers. Our country is one of the few that passed the law necessary to implement green procurement. In addition, we have achieved with great success in promoting eco-label system.

TCG Green Procurement Program was developed in accordance with national policy to purchase equipments and office supplies with eco-label. Seminars were frequently organized to enhance the knowledge on green procurement. In 2001, the outcomes of TCG in purchasing green products reached a satisfactory 55%. We set a target to reach 80% by year 2006.

Figure 3: Chronological Data of Recyclables in Taipei



Zero Waste To Landfill Event Campaign

Recent attempt from the Office of Resources New South Wales demonstrated a Waste Wise Festival with absolutely no waste from the festival going to landfill was achievable. City Government then applied this brilliant idea to 2003 Taipei Lantern Festival to show our citizens that you can enjoyable yourselves, while at the same time, without leaving a great deal of trash behind. A Three s company recyclable bin was specially designed for the occasion to collect recyclables, non-recyclables and food waste for composting, respectively. To prepare the brand new challenge,

TDEP organized 1,143 volunteers and workers for this event. The festival lasted for ten days, and estimated attendance is over four million. Roughly 36 tons of waste was collected on site, and 23 tons of which were either recyclables or food waste suitable for composting. Remarkably, the recycling rate reached up to 63%, and 70% of the waste were placed correctly into the designated bin by participants of the festival. For those who dump the trash on the ground, 16 citations and 54 notice of improvement were issued. TDEP is planning to apply this encouraging experience to future activities, and modify the plan of implementation considering the actual situation to achieve the goal of waste reduction and resources recycling.

Vision for 2010 Total Recycling and Zero Landfill

To transform Taipei into an eco-city capable of sustainable development, TCG proposed the 2020 Vision of Total Recycling and Zero Landfill three years ago. After three years of hard work and promotion, and the advancement of recycling technology, TDEP reevaluated and declared that the vision could be reached by 2010, ten years earlier.

Definition

“Zero Landfill” by definition means that all municipal waste will be either recycled or reused, including energy recovery from combustible waste, composting or animal feed from organic waste, and reuse of waste materials such as metal, glass, paper, construction waste and incinerator ashes, and kitchen leftovers etc, and landfill will no longer be needed for final waste disposal. Through zero landfill, valleys or low lands need not be developed for waste disposal, thus natural environment can be preserved.

Furthermore, resources may re-enter our lives through detail sorting and total recycling to

stop depletion. The concept of zero landfill can also promote the development of green industry. In order to achieve the 2010 vision, we should seriously examine the waste we produce everyday, actively develop the reuse technologies that are more economically competitive, and eagerly create green products that are low budget, low energy consumption and low pollution. Therefore, recycled materials and raw materials are both available on the market.

Ten Strategies

TDEP is implementing the following strategies to achieve the goal of Zero Landfill and Total Recycling :

Strategy (1) Crack down the illegal use of counterfeit trash bags and improve the implementation of PBTCF: Organize a anti-counterfeit squad team to work closely with the division crew to perform a double check on the routes that counterfeit problems are most serious. Anti-counterfeit label is required to attach to each trash bag, and crewmembers are trained to identify the real label.

Strategy (2) Mandatory sorting and recycling for private businesses and haulers: TDEP has applied the strategy of mandatory sorting and recycling to private businesses and waste haulers. TDEP offers assistance to all businesses and apartment buildings in installing recyclable collection bins, and demands resources recycling. The examination mechanism will be set up for waste entering either incinerators or landfill site.

Strategy (3) Recycled and reuse of organic waste (including food waste and treated sludge): TDEP is at the same time promoting sorting and reuse of organic wastes. The program includes retrofitting collection truck for both general waste and kitchen leftover, building composting facility and bag breaker and storage facility. The reuse channel of kitchen leftover has been developed at the same time. Parks and schools are required to practice composting on site. Sludge from water

treatment facility will be either handled through incinerator or anaerobic digester. And private companies are invited to invest on composting facility.

Strategy (4) Shredding, sorting and recycling of bulky waste and construction waste: All waste mattresses reaching landfill site will be first disassembled, and the metal parts will be taken out for recycling. All waste reaching incinerators will be shredded first before combustion. Over-sized waste will be sent to the landfill site for shredding, the remaining combustible portion will then be returned to the incinerators for combustion. Construction waste will be required for crushing and grading in the next four years, and TDEP is still searching for the reuse channel of construction waste.

Strategy (5) Introducing total waste sorting facility: Waste reduction and recycling has been successfully carried out through the implementation of PBTCF and mandatory sorting required by law. To further minimize the waste volume into the incinerator, total sorting facility will be built at each incinerator to mechanically and effectively perform detailed sorting.

Strategy (6) Caloric recovery of non-recyclable waste (including gutter and treated sludge): All combustible waste excluding recyclables and food waste shall be incinerated for energy recovery to minimize waste volume into landfill.

Strategy (7) Establishing annual maintenance alliance, raw waste should be stored in the bunkers rather than transported to landfill site: TDEP will contact adjacent cities, such as Taipei County, Keelung City and Taoyuan County, in the near future to organize an annual maintenance alliance to expand the storage capacity. Before the annual maintenance of each incinerator, bunkers need to be emptied to accommodate waste volume collected during that period. Waste will be transported and incinerated in full capacity immediately after the maintenance is over.

Strategy (8) Sorting and reuse of waste from disaster: Transport stations will be set up at the disastrous area, and waste will be grouped according the odor intensity of the waste. For those tends to smell easily will be incinerated as soon as possible, and the others will be taken down to the landfill site for temporary storage, shredding and sorting at the same time. Combustible waste will be transported back for incineration later on. Soil and rocks will search alternative channel for reuse.

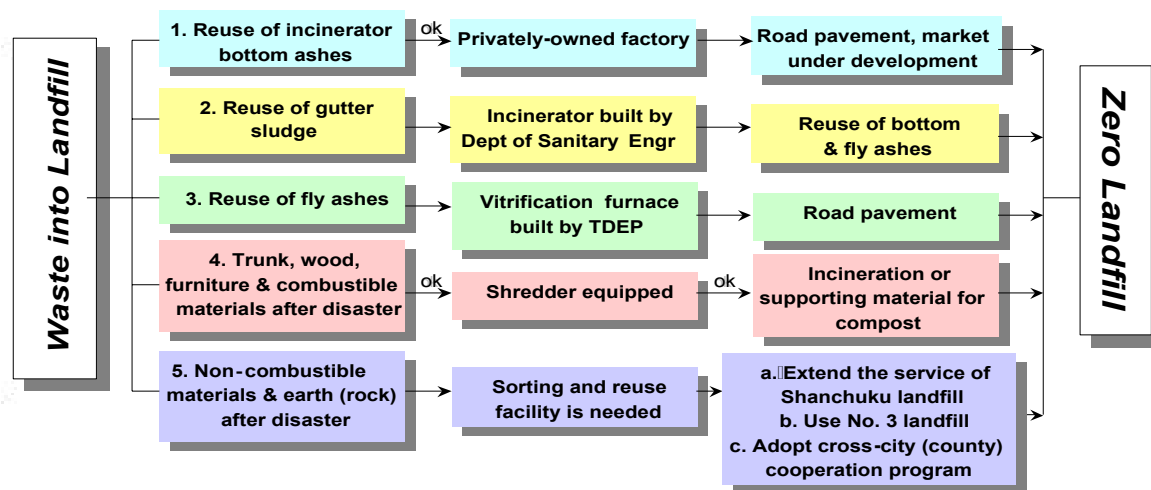
Strategy (9) Grading, solidification or vitrification of incinerator ashes: To establish the standard for the quality of the product, the pilot project for the reuse of incinerator bottom ashes is undertaking. At the same time the market is under development. Through Government Procurement Law, bottom ashes may be processed by private plant for reuse, or city government may build its own reuse plant through BOT. Planning and building a vitrification plant for reusing fly ashes is also under consideration.

Strategy (10) Promoting cross-city (county) cooperation program to expand emergency landfill capacity: To exchange for emergency landfill and temporary storage capacity during disaster, TDEP will establish cross-city (county) cooperation mechanism with Keelung City, Taipei County and Taoyuan County and sign cooperation agreement to support each other on emergency waste disposal. This program will not only extend the time we need for market development on the reuse of bottom ashes and compost, but also create the opportunity of discarding No. 3 landfill site.

Bottlenecks

The bottlenecks waiting for break through at this moment are the immaturity of reuse technology for some of the waste material, underdeveloped market for such recycled products as compost and aggregate from incinerator bottom ash. In addition, the cooperation program with Keelung City on waste management is yet to be approved by Taipei City Council, etc (Fig 4&5).

Figure 4: Bottlenecks waiting for break through (1)



Time Table and Supporting Projects

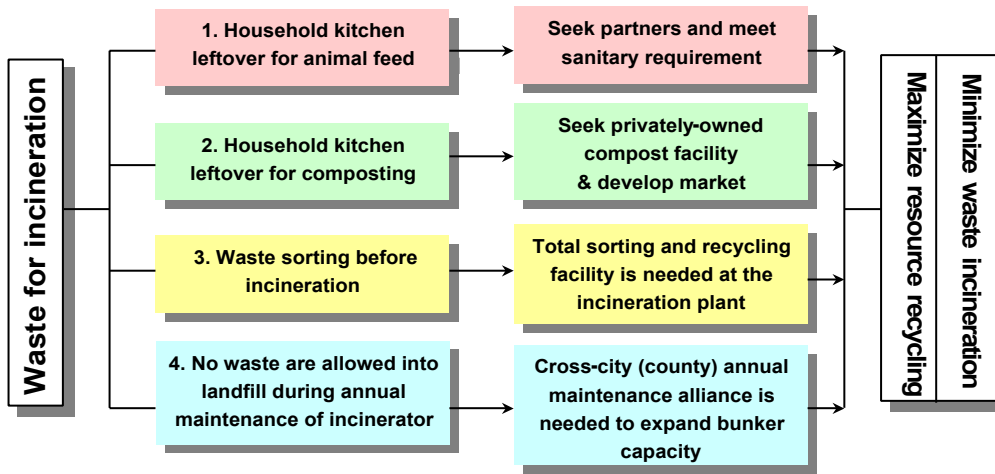
With respect to the reuse of incinerator bottom ashes, TCG will initiate the waste disposal cooperation program between Taipei and Keelung City. During 2003 to 2006 50% of the bottom ashes will be reused through partnership with the privately owned business, and the other 50% will be transported to Keelung City for landfill. After 2007 all bottom ashes will be handed over to the privately owned business for reuse. Incinerator fly ashes will use landfill as final waste disposal method after solidification between 2002 and 2004. Beginning of 2005 vitrification project will be planned and tested for fly ashes. The vitrification plant capable of processing 30 tons/day of fly ashes will be completed before 2008 (Table 2).

Presently, small amount of sewage treatment plant and gutter generated sludge are experimentally incinerated with general waste. Between 2003 and 2006 roughly 30% of the sludge will be incinerated with general waste. Starting 2007 all sludge will be transported to sludge incinerator or dryer built by the Department of Sanitary Engineering for reuse.

Regarding the reuse of food waste, supporting programs such as the design of garbage trucks for food waste and household waste, the establishment of transport facility for pig rearing, and the construction of pilot composting facility at Shanchuku Landfill were quite successful. The privately or publicly owned composting facility will be completed in 2003, which is expected to handle part of agricultural waste. Pig rearing industry is committed to digest all food waste suitable for pig rearing. By 2005 privately owned composting facility is expected to process 100 % of food waste suitable for composting.

Starting 2004 the planning of three privately owned total sorting and recycling facilities, each capable of processing 700 tons/day of waste is expected to complete. The total sorting and recycling rate will reach 15%, 33%, 67% and 100% by 2005, 2007, 2008 and 2009 respectively. Composting facilities for the sorted out organic waste will also be started by 2004, and the processing rate is expected to reach 15%, 33%, 67% and 100% by 2005, 2007, 2008 and 2009.

Figure 5: Bottlenecks waiting for brak through (2)



Waste collection and disposal is one of the basic urban services. To effectively manage waste, rather than dispose of waste, is far more economic in solving waste problem. Taipei city used to adopt downstream management philosophy for waste collection and disposal policy, which was challenged by the non-stop growing waste volume. If we do not practice recycling at this instant, the limited resources of the earth will be depleted and

the development of human race will be directly affected. Taipei City is proud of its success in waste reduction and resource recycling in recent years, yet there is a long way to go before reaching the final goals of zero landfill and total recycling. To face the challenge, we need perfect planning, promote supporting projects and most important, the cooperation and support from Taipei citizens to ultimately transform Taipei into an eco-city. ■