3C

Consideration to Human and Ecofriendly for the Earth!

3S

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

Recycle in Circular Economy

Resource Recycling in Taiwan

Chii-Pwu Cheng
Recycling Fund Management Board
Taiwan Environmental Protection Administration

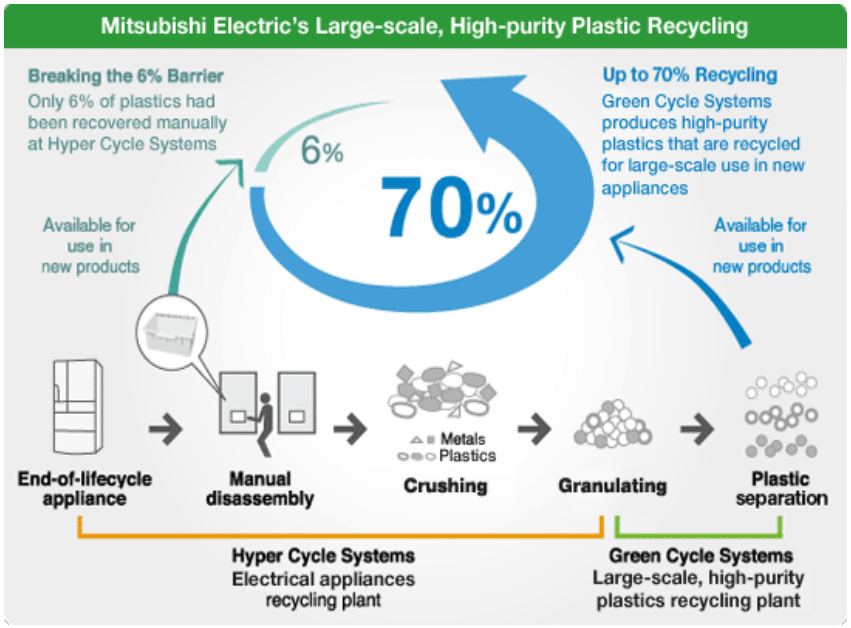
1. Circular Economy

2. Status and industries of circular economy in Taiwan

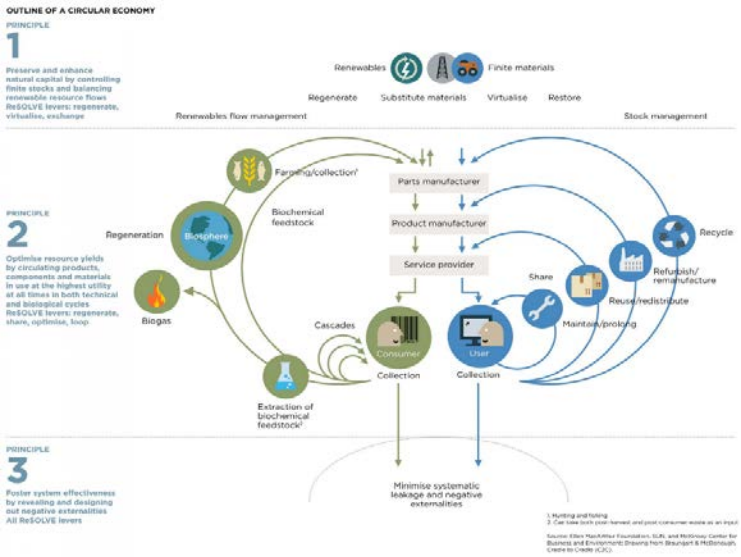
3. Strategy Development

4. Future Prospect.

Circular Economy



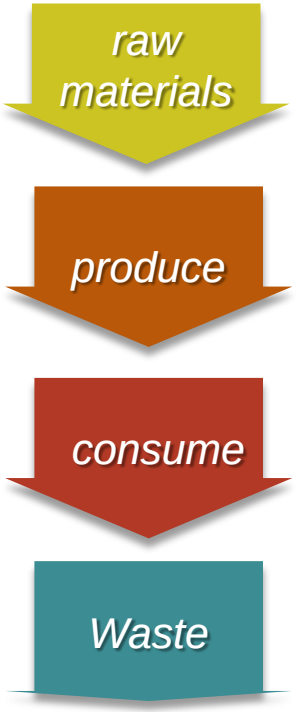
Basic Law for Establishing the Recycling-based Society, Japan, 2000



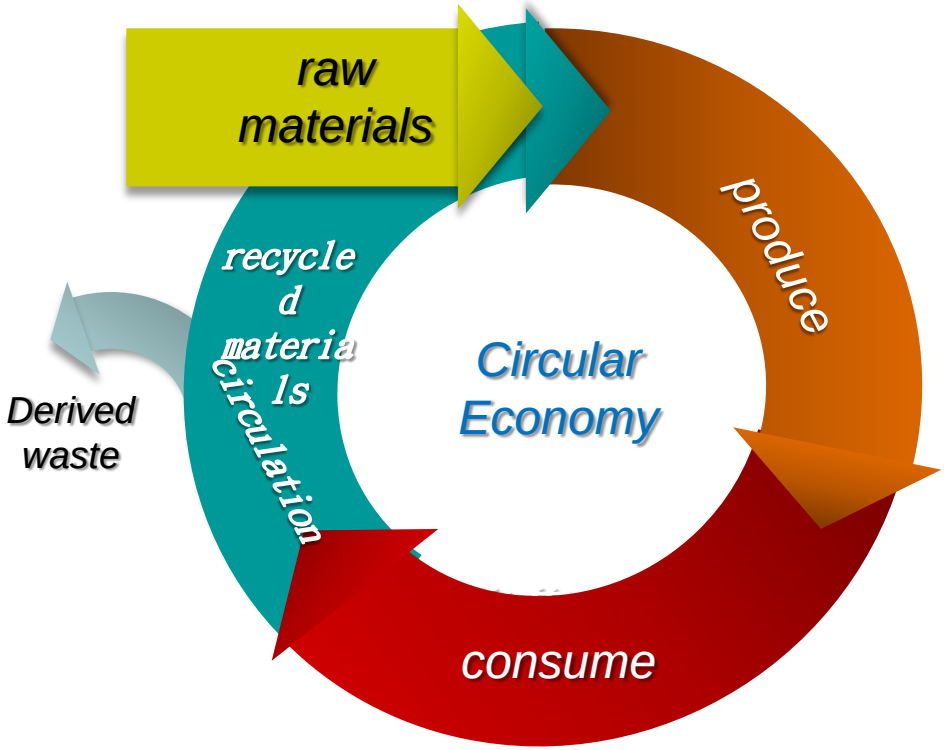
A Recycling and Reuse Oriented Manufacturing and Consumption Economy

Circular vs. Linear Economy

Linear Economy



Circular Economy



Status and industries of circular economy in Taiwan

Taiwan: The World's Geniuses of Garbage Disposal

How the island, with landfills not far from capacity, became one of the world-wide leaders in recycling

Taiwan's recycling rate of 55% makes it a world leader. Here are some numbers to know. Photo: Joyu Wang/The Wall Street Journal

By Kathy Chen
May 17, 2016 5:05 p.m. ET
Taipei

https://www.wsj.com/articles/taiwan-the-worlds-geniuses-of-garbage-disposal-1463519134

The Wall Street Journal
2016年5月18日 ·

Once dubbed Garbage Island, Taiwan has emerged as an international poster child for recycling.

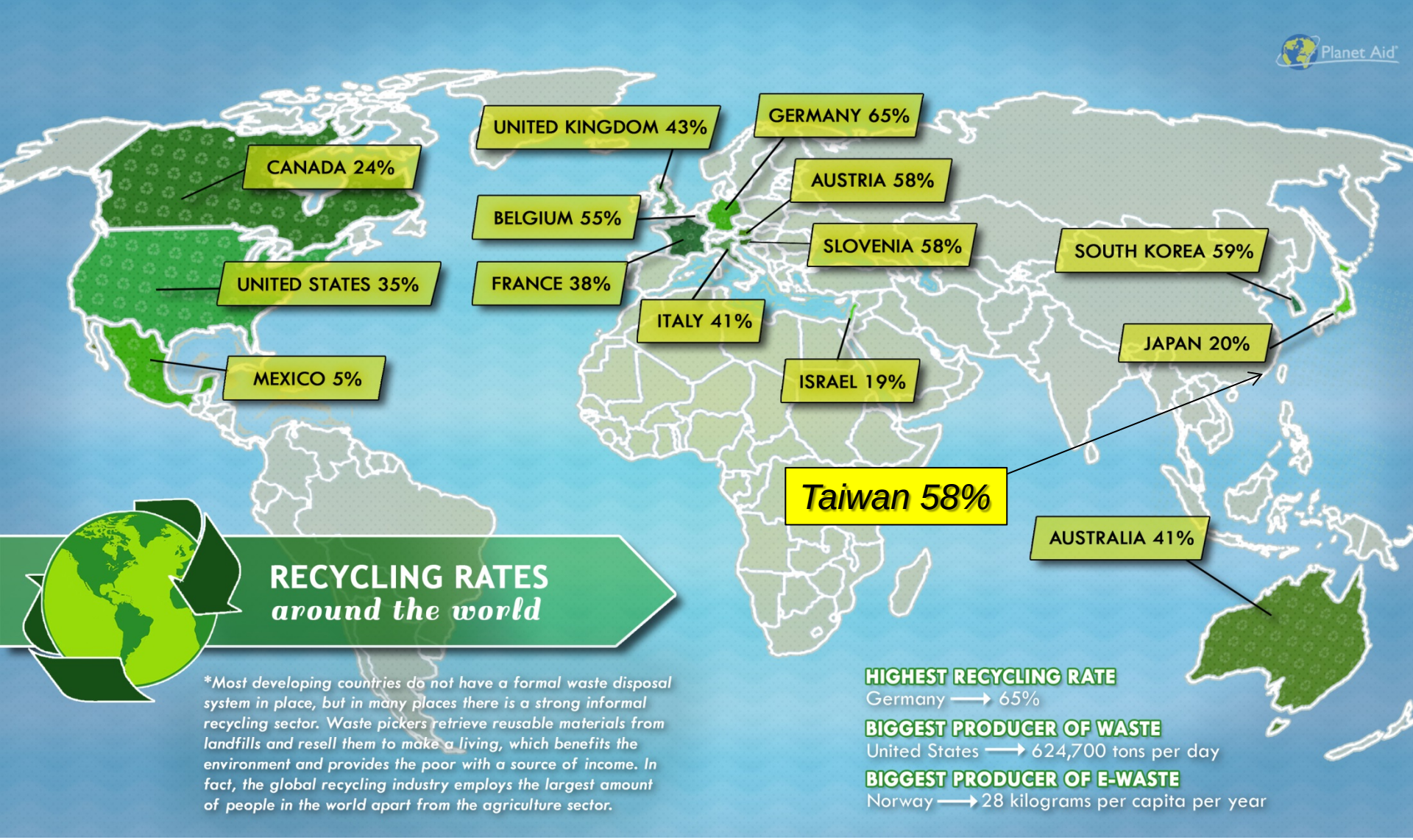
翻譯年糕

Taiwan: The World's Geniuses of Garbage Disposal

How an island nation with landfills not far from capacity became one of the world-wide leaders in recycling.

ON.WSJ.COM

https://www.facebook.com/wsj/posts/10154311527313128



http://www.planetaid.org/blog/global-recycling-rates

Sources:
Baldé, C.P., Wang, F., Kuehr, R., Huisman, J. (2015), The global e-waste monitor – 2014, United Nations University, IAS – SCYCLE, Bonn, Germany.
http://i.unu.edu/media/unu.edu/news/52624/UNU-1stGlobal-E-Waste-Monitor-2014-small.pdf
L Hoornweg, Danie, and Perinaz Bhada-Tata. What a Waste: A Global Review of Solid Waste Management. Rep. Vol. 15. World Bank, 2012.
http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf
OECD (2015), Environment at a Glance 2015: OECD Indicators, OECD Publishing, Paris.
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Evolution of Resource Recycling in Taiwan

Main Program

Extended Producer Responsibility Introduced

Four-in-One Recycling Program

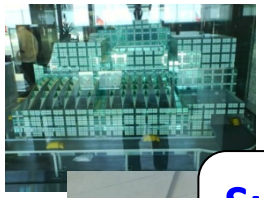
2010 Sustainable Material Management
2005 Mandatory Garbage Separation
2003 Bulk Waste Recycling
2001 Food Waste Recycling
2000 Unit-Pricing Bags in Taipei

1988 1997 1998

Market-driven recycling	*Manufacturers and Importers stage 1*	*Eight Recycling Funds Management Board Stage 2*	*TEPA Recycling Fund Management Board Stage 3*
Regulated Recyclable wastes	1989 ● Container , Tire 1990 ● Pesticide container ● Lead-acid battery 1994 ● Vehicles	1997 ● General battery ● IT equipment 1998 ● Home appliance	2002 ● Light bulbs/tubes 2007 ● Computer keyboard ● Electric fan 2008 ● HID lamp 2010 ● Bioplastics 2014 ● External hard drive ● Tablet PC

4-in-1 Resource Recycling Program

Waste Generators

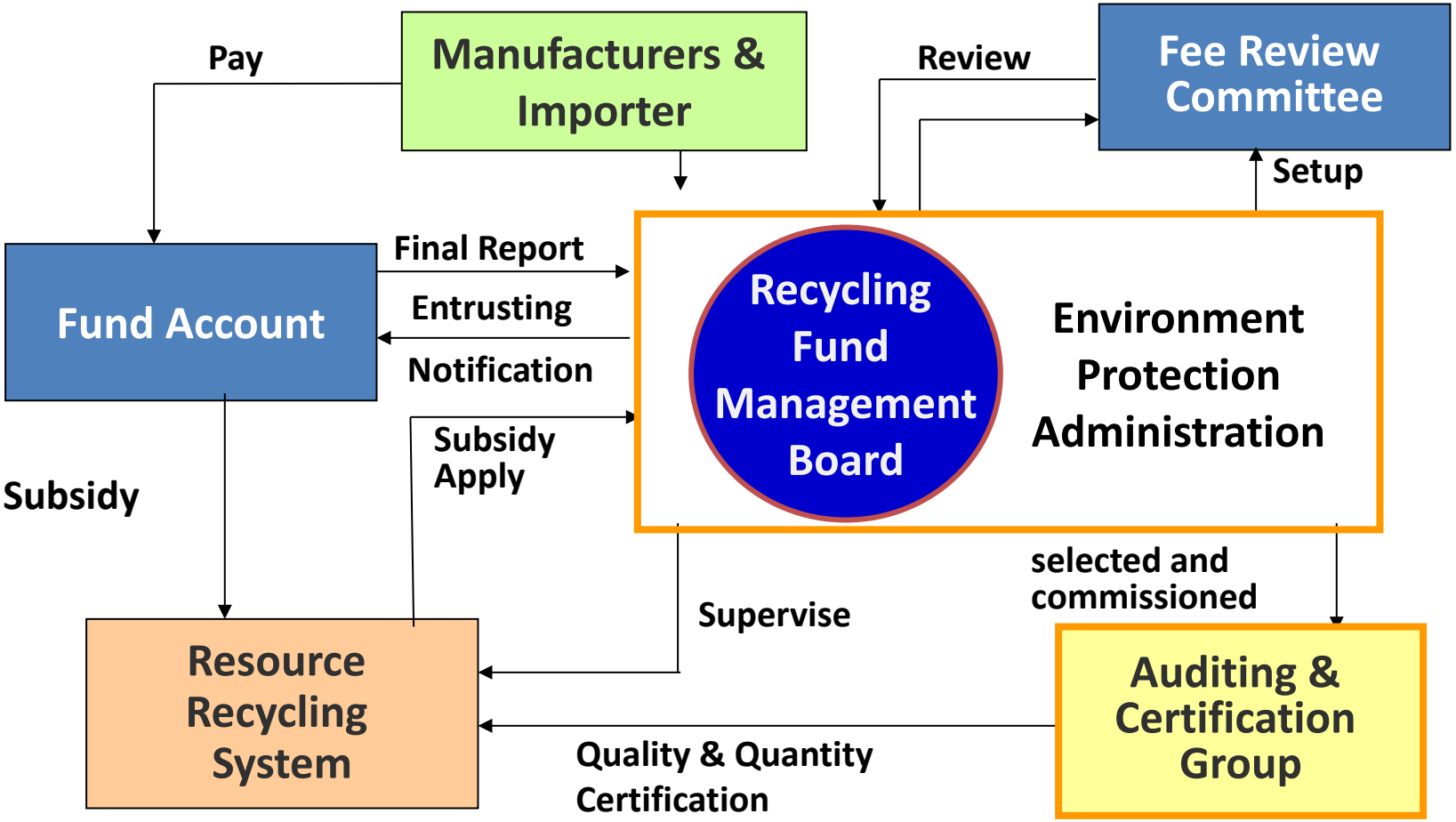


Subsidy Support

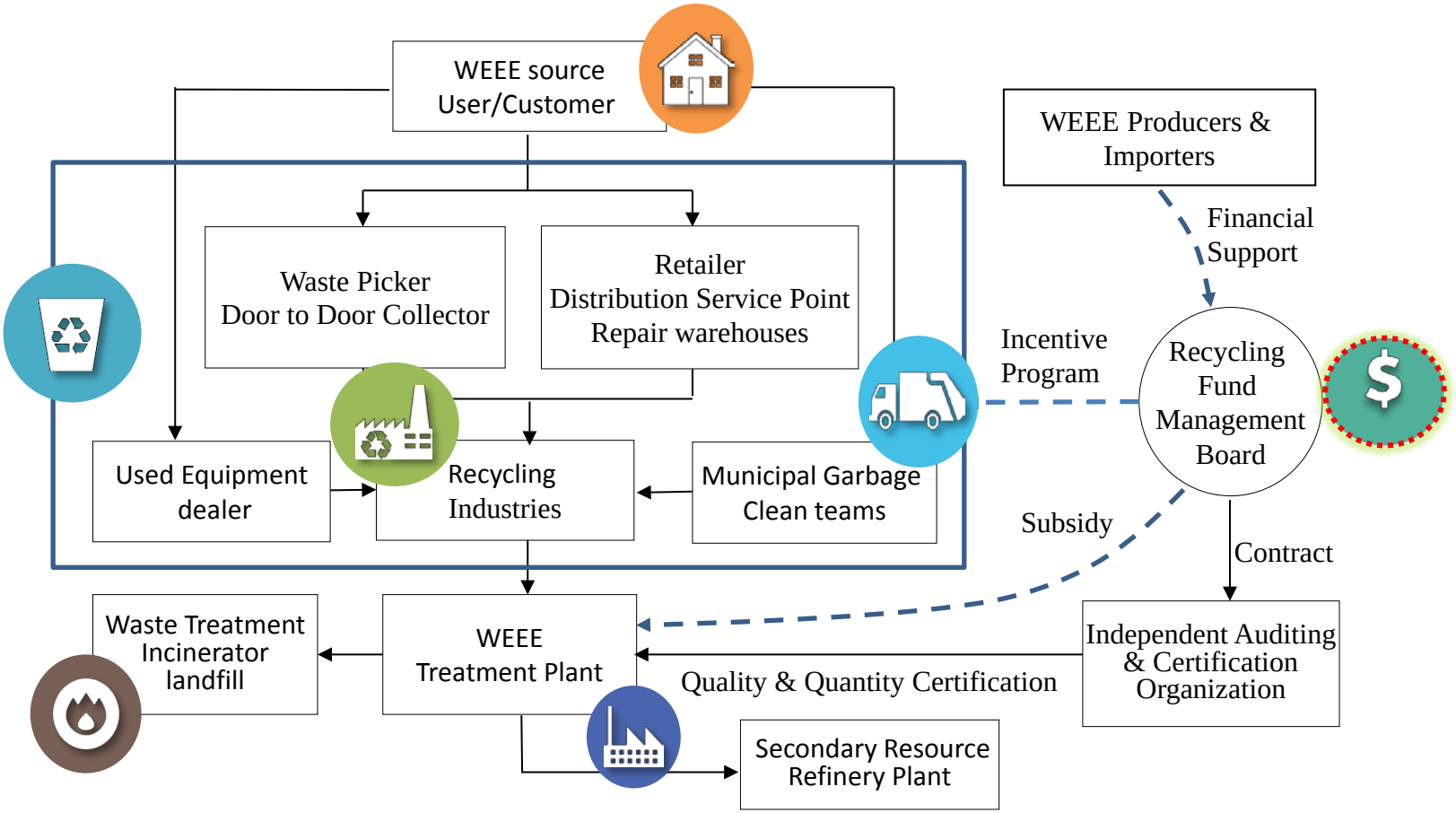
Private Recycling System

Government Collection System

Framework of Resource Recycling Fund



Show Case



WEEE recycling and processing system framework in Taiwan

Cheng, CP. & Chang, TC. , The development and prospects of the waste electrical and electronic equipment recycling system in Taiwan, J Mater Cycles Waste Managemnet (2017). doi:10.1007/s10163-017-0612-6t.

Six Focal Areas for Taiwan's CE

A. Effectiveness of recycling

B. Resource recovery of organic waste

C. Materialization of inorganic waste

D. Urban mining

E. Circular economy industrial park

F. Business model

Precious Minerals Recycling

Tin residue	→	4N Tin Ingot 
Zinc residue	→	Zinc chemicals 
Indium residue	→	Indium Ingot/ITO 
Copper residue	→	Copper/Copper chemicals 
Waste catalyst/HDS/RDS	→	V/Mo/W chemicals 
Waste etching solution	→	Phosphoric acid products

Scrap tire

Annual value $175 million/year

- Every year
  - ✓ **12 million** scrap tires has been recycled

Scrap tire

Chips

Annual value $130million

1. Auxiliary fuel

2. Carbon black
   Cracked oil

Rubber powder

Annual value $45million

3. Rubber product

4. Rubber asphalt

- ✓ Noise reduction
- ✓ Splash reduction
- ✓ Extend the life span

Annual value
$2.57 billion/year

In 2015, 69,000 tons of Lead Battery Scrap has been recycled.

Recycled Materials

99% Lead bullion + Plastics (PP/ABS)

Output

- ➢ Plastics (6%)
- Usage: Pedal, Hanger, Bike saddle
- ➢ Lead bullion(78%)
- Usage: Plumb bob, Lead grid…

Annual value
$2.6 billion/year

The amounts of recycling

- 446,000 *vehicles*
  - 160,000 for cars and 286,000 for scooters
- Treatment rate: 72.54%

Resource

Compare Reuse and Recovery Rate

- 2013 in EU: 90.4% (Goal in 2015: 95%)
- 2015 in Taiwan: 97.6%

Output

- reuse：34.7%
- ferrous metal ：40.7%
- Non-ferrous metal ：0.5%
- Others(Lead Battery Scrap, *Scrap tire….)*：9.8%
- Energy recovery：11.9%

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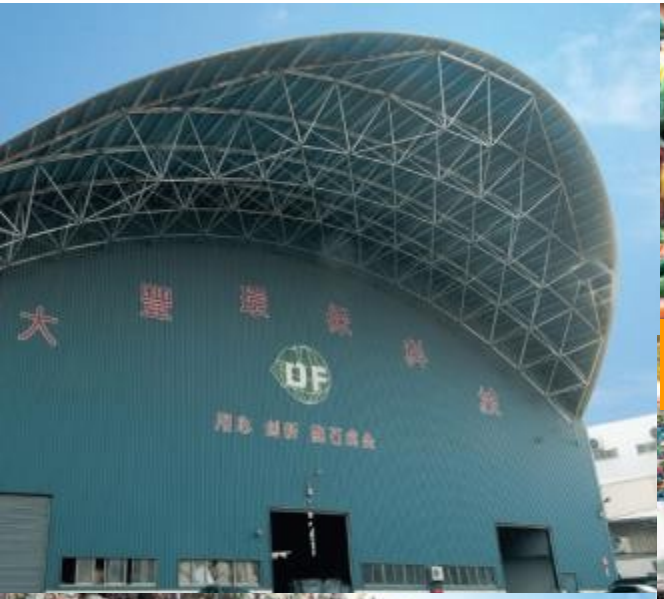
Plastic Circulation Value Chain in Taiwan

- one-stop plastic regeneration



to regenerated plastic grains

to consumer products

from waste

From Waste to Textiles

- Taiwan's innovation

10 teams in FIFA 2014 played with recycled PET-textile made in Taiwan

Circular Economy

PET bottles and coffee grounds as materials for producing eco-friendly functional fabrics

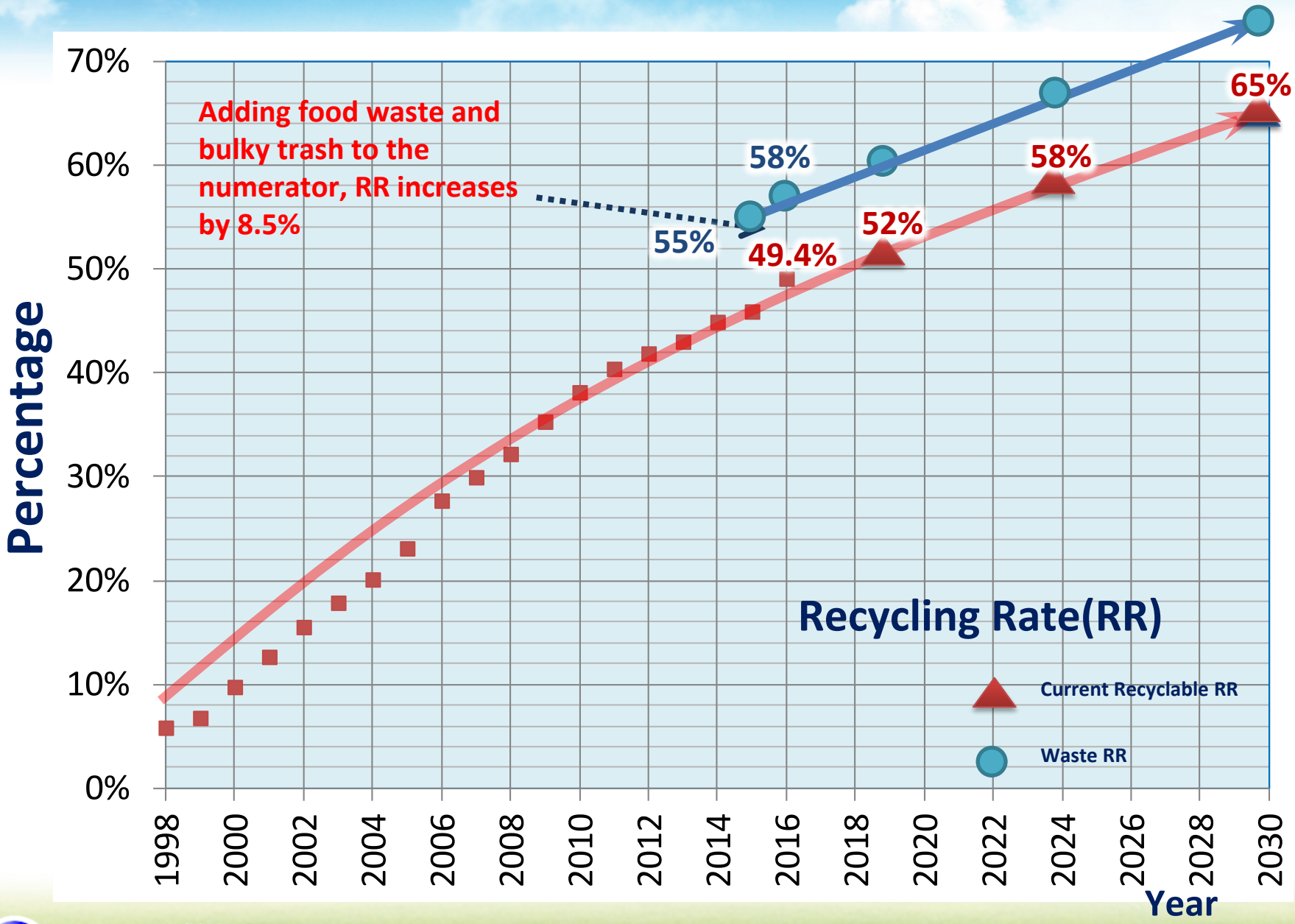
Taiwan ranked No.1 in the worldwide functional fabrics market in 2015 with global market share reaching 50.37%.

Source: Far Eastern New Century, Singtex Industrial

Strategy Development

Strategy Development

Current issue	Tool	Future Direction
• recycling rate • utilization rate • energy recovery • secondary raw material	• regulation • economic instrument • incentives • technology • education • participation • dialogue • open information	• Feedstock diversification • leak elimination • products greener • resource efficiency • R & D


Adding food waste and bulky trash to the numerator, RR increases by 8.5%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
Year
55%
58%
49.4%
52%
58%
65%
Recycling Rate(RR)
Current Recyclable RR
Waste RR

Future Prospect

"We must not endlessly expend natural resources and the health of our citizens as we have done in the past. Therefore, we will strictly monitor and control all sources of pollution.

We will also bring Taiwan into an age of circular economy, turning waste into renewable resources. *We will gradually adjust our energy options based on the concepts of sustainability.*

The new administration will seriously address issues related to climate change, land conservation and disaster prevention. ***After all, we only have one earth, and we only have one Taiwan.***"

——《President Tsai's inaugural address》

「我們也不能再像過去，無止盡地揮霍自然資源及國民健康。所以，對各種汙染的控制，我們會嚴格把關，更要讓台灣走向循環經濟的時代，把廢棄物轉換為再生資源。對於能源的選擇，我們會以永續的觀念去逐步調整。新政府會嚴肅看待氣候變遷、國土保育、災害防治的相關議題。因為，我們只有一個地球，
我們也只有一個台灣。」

——《蔡英文總統就職演說》2016年05月20日

Collaboration among all parties

Industry	• Invest to enhance resource technologies and industrial restructuring & cooperation
Institute	• Research and develop the technologies of high-value waste resources to improve economic efficiency
Academia	• Educate and promote the concept of circular economy, and strengthen academic communication and technology introduction
Government	• Enact policies of circular economy, • provide information, build up cooperation platform • create incentives, and remove regulatory barriers

Taiwan EPA is sincerely looking forward to establishing a collaborative relationship with our friends for the following aspects:

- Industrial partnership
- Recycling technology
- Practical trainings
- Regulations & policies

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