

**The Effect of Global Green Economy on Taiwan's
Environment-Related Goods Export**

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Abstract:

As Green Economy has become a global trend and rising concept among governments, it is important to examine the effects of this campaign on industries to what extent. According to The International Institute for Management Development (IMD, 2010)¹, Taiwan's green technology competitiveness is ranked second to Japan in Asia and sixth in the world. Therefore, with green economy prevailing, the purpose of this study is to investigate the market performances of Taiwan's environment-related industries, whether they have international competitive advantages? How does green economy shape the industries? In addition, we would like to investigate in the major market barriers that industries face and what government can assist. The study found that Taiwan's environment-related businesses are small in terms of the market size and most of them focus only on the domestic market; expanding to international market for them is not easy. Although green technology competitiveness of Taiwan performs well compared to most countries, the production cost in Taiwan cannot compete with those countries with large market scales. In terms of the assistance they need, green policy in different countries and financial assistance are probably two major areas necessary for them to promote environmental related industries. Especially the collection of information about international green regulations and public procurements is important to business. Financial measurements and assistances to are also needed.

¹ IMD World Competitiveness Yearbook 2010.

1. Introduction

Compared to Europe, America and other environmental markets in developed countries, the domestic market in Taiwan is relatively small and limited. Only if the government can strengthen and implement environmental regulations and environmental awareness become highly noticed, then the demand for environmental goods and services increase in the market. In other words, environmental regulations and environmental awareness are major demand factors of environmental goods and services.

Therefore, the imports and exports of environment-related goods and services are affected by environmental regulations, such as tariff and environment-related subsidies, e.g., Feed-in-Tariff for renewable energy provided in many countries. In recent years, Taiwanese pollution control equipment has been increasingly exported to China, Indonesia, India and other markets (see Table 1), showing the market demand in these countries for pollution control equipment has improved. With the increasing demands in exports of environment-related goods and services from Taiwan, how to further explore overseas markets will be the focus of concerns.

**Table 1: Top 10 Export Countries of Taiwan's Environmental Protection
Equipment, 2006-2012**

Unit: thousand NT\$

Year	Rank	1	2	3	4	5	6	7	8	9	10
2006	Destin- ation	US	China	Japan	Singapore	UK	Hong Kong	Thailand	Malaysia	Germany	Germany
	Total Export	67,003	61,448	15,752	11,961	9,242	9,030	8,824	8,085	6,004	5,697
2007	Destin- ation	US	China	Japan	Singapore	UK	Thailand	Germany	Vietnam	India	Germany
	Total Export	85,066	63,693	15,435	12,285	9,048	8,572	8,188	7,877	7,749	7,037
2008	Destin- ation	US	China	Japan	Thailand	Vietnam	Singapore	Hong Kong	Thailand	UK	Germany
	Total Export	3,076,338	102,545	68,277	16,359	11,099	10,876	10,560	9,704	9,500	9,288
2009	Destin- ation	US	China	Japan	Vietnam	Singapore	Thailand	Turkey	Germany	UK	India
	Total Export	95,436	50,277	12,304	11,451	8,674	8,342	8,061	7,024	7,009	6,269
2010	Destin- ation	US	China	Japan	Vietnam	Singapore	Thailand	Thailand	Germany	Turkey	India
	Total Export	112,183	77,229	17,088	11,997	10,620	10,577	9,842	9,680	9,079	8,243
2011	Destin- ation	US	China	Japan	Germany	Singapore	Vietnam	Turkey	Hong Kong	Malaysia	India
	Total Export	99,357	73,302	47,736	15,433	14,329	12,220	11,144	7,765	7,533	7,456
2012	Destin- ation	US	China	Japan	Germany	Vietnam	Singapore	Thailand	Vietnam	Hong Kong	Turkey
	Total Export	109,016	78,291	37,726	13,986	12,995	10,149	9,724	12,995	9,194	8,320

Source: compiled from EPA and DGBAS.

According to The International Institute for Management Development (IMD, 2010)², Taiwan's green technology competitiveness is ranked second in Asia and sixth in the world. Taiwan's LED and solar photovoltaic equipment production are both ranked number two in the world while Taiwan is also considered one of the

² IMD World Competitiveness Yearbook 2010.

competitive countries in ICT industry in the global market. However, environment-related industries have being more domestic-market oriented with a limited economic scale. So the questions become to be “Are Taiwanese environment-related industries competitive compared to its neighboring countries,” “Are they doing well in the globe markets in terms of exporting” or “Does global green economy help Taiwanese environment-related industry growing?”

The purpose of this study is to examine the market performances of Taiwan’s environment-related industries to see whether they have international competitiveness, or what kind of goods and services they are exporting abroad and to what markets. In order to answer these questions, this study also conducted a survey on Taiwanese companies for the aspects including company characteristics, their annual sales values, and their major exporting markets. In the survey questionnaire, we also included the opinion questions, such as the major barriers they face in the global markets and what governmental assistances they need in order to expand their green competitiveness.

2. An Overview of environment-related industries in Taiwan

Firm Number and Output Value

This study compiled the census data during the target years from the Environmental Protection Administration (EPA), the Directorate-General of Budget, Accounting and Statistics (DGBAS) and other official data sources. Table 2 shows the number of firms of Taiwanese environment-related industries. The number of firms increased from 4,612 in 2005 to 6,891 in 2012. In terms of subsectors, the number of firms in environmental services, environmental resources and environmental equipment in 2012 are 5,044, 1,401 and 445.

Table 3 shows the output values of environment-related industries from 2005 to 2012. The output value was 162 billion in 2005, and reached to 235 billion in 2007. Because of the financial tsunami in 2008 and 2009, the output value of environment-related industries fell sharply and then gradually picked up in 2011 and 2012 with the overall environmental industry output of NT\$ 244 billion and NT\$ 258 billion respectively.

In terms of percentage, environmental services sector accounted for 44.66% in all environment-related industries, followed by the environmental resources sector 40.17% and 15.18% of environmental equipment industry. Due to the rapid growth in 2007, environmental services industry accounted for 53.94% but fell to 45.79% in the following year and remained at about 44% since then.

Based on the observation above, the output value of the environmental services industry is more vulnerable; when the economy grows, which increases demands and outputs, the output value of the environmental services industry changes dramatically. Conversely, environmental resources industry is less vulnerable. Even with the financial tsunami in 2008 and 2009 making the domestic market demand decline, environmental resource industry still remained at 82 billion in the year 2008 and 81.3 billion or so in 2009 (see Table 3). Total output value of environmental-related industry accounts for 2% of GDP in Taiwan, not including renewable energy industries.

Table 2: Number of Firms in Taiwanese Environment-related Industries, 2005-2012

Class	2005	2006	2007	2008	2009	2010	2011	2012
1. Environmental testing services	67	184	82	84	88	92	97	103
2. Wastewater treatment	540	556	309	304	306	311	657	323
3. Waste disposal industry	1,608	2,649	2,134	2,364	2,462	2,550	2,969	2,662
4. Environmental engineering and technical consultancy services	160	213	96	94	97	103	110	117
5. Pest control operators	410	433	502	537	582	591	624	659
6. Recycling industry	702	543	849	880	877	794	1,155	844
7. Remediation services	238	241	134	132	133	135	157	140
8. Energy technical services (ESCO)	20	23	27	30	62	130	127	175
9. Environment-related verification services	11	11	11	11	11	11	12	13
10. Environmental management and technical services	14	14	6	6	6	7	7	7
Subtotal Environmental services	3,771	4,867	4,150	4,442	4,624	4,723	5,915	5,044
1. Environmental equipment	226	251	242	237	238	224	330	335
2. Environmentally materials	75	83	77	80	83	81	82	111
Subtotal Environmental equipment	301	334	319	317	321	305	412	445
1. Water supply	10	11	8	8	8	8	10	8
2. Recycled material manufacturing	530	686	915	1,126	1,100	1,252	1,319	1,393
Subtotal Environmental resources	540	697	923	1,134	1,108	1,260	1,329	1,401
Total Environmental-related Industry	4,612	5,898	5,392	5,892	6,053	6,288	7,656	6,891

Note: This table shows only environment-related industries, "renewable energy industries" are not included.

Source: the study compiled from EPA and DGBAS.

Table 3: Output Value of Taiwanese Environment-related Industries, 2005-2012

Unit: NT \$

Class	2005	2006	2007	2008	2009	2010	2011	2012 (e)
1. Environmental testing services	2,494,989	3,443,991	1,698,134	2,041,614	1,670,940	2,523,222	2,727,098	2,947,448
2. Wastewater treatment	2,082,939	3,506,996	3,742,510	3,993,840	4,262,048	4,548,267	4,853,708	5,179,661
3. Waste disposal industry	23,392,742	32,159,209	71,179,173	50,348,514	44,065,687	41,177,263	49,807,482	50,818,574
4. Environmental engineering and technical consultancy services	4,878,107	4,551,947	5,530,286	5,590,180	6,086,369	6,636,372	6,644,192	6,542,993
5. Pest control operators	1,216,521	1,342,918	1,185,863	1,509,043	1,391,950	1,554,312	1,715,805	1,894,077
6. Recycling industry	26,710,046	16,933,827	37,299,925	26,461,354	27,082,556	23,453,086	32,049,067	34,840,541
7. Remediation services	3,139,823	2,456,658	2,423,910	2,391,599	2,359,718	2,328,262	2,297,226	2,266,603
8. Energy technical services (ESCO)	372,700	537,300	1,198,400	2,252,200	2,065,100	3,591,700	6,650,000	7,920,000
9. Environment-related verification services	1,627,567	1,599,417	1,571,754	1,544,570	1,517,856	1,491,604	1,465,805	1,440,000
10. Environmental management and technical services	941,059	784,035	1,144,677	1,247,473	1,019,331	1,020,773	1,061,910	1,104,705
Subtotal Environmental services	66,856,493	67,316,298	126,974,632	97,380,387	91,521,555	88,324,861	109,272,294	114,954,602
1. Environmental equipment	11,684,160	7,500,075	12,430,597	14,415,603	11,354,509	12,830,122	13,796,230	14,835,086
2. Environmentally materials	13,867,432	17,397,800	20,368,129	18,808,199	19,490,140	26,536,926	19,433,905	20,984,731
Subtotal Environmental equipment	25,551,592	24,897,875	32,798,726	33,223,802	30,844,649	39,367,048	33,230,135	35,819,817
1. Water supply	32,788,093	33,284,025	33,620,000	33,841,542	32,600,000	33,841,000	35,754,783	36,287,529
2. Recycled material manufacturing	36,400,000	38,500,000	42,000,000	48,200,000	48,700,000	54,400,000	65,800,000	65,800,000
Subtotal Environmental resources	69,188,093	71,784,025	75,620,000	82,041,542	81,300,000	88,241,000	101,554,783	107,660,789
Total Environmental-related Industry	161,596,178	163,998,198	235,393,358	212,645,731	203,666,204	215,932,909	244,057,212	258,435,208

Note: This table shows only environment-related industries, "renewable energy industries" are not included.

Source: the study compiled from EPA and DGBAS.

Imports and Exports of Environment-related Equipment

Table 4 shows the aggregated amount of Taiwanese environment-related equipment import and export from 2006 to 2012. From the overall trends, the total imports of environment-related equipment remained stable, ranged from NT\$ 9.7 to 13.4 billion. The exports show steady growth with total exports growing from NT\$ 7.7 billion in 2006 to 11.9 billion in 2012. Compared with imported environment-related equipment for the period between 2001 and 2005, the sum of imports and exports shows relatively large magnitude of changes since 2006. The 2007 growth rate of imports is 21.49% with 14.90 % growth rate of exports. But in 2012, the growth rate of import was -4.54% with only 1.34% of growth in export. In 2008 and 2009, due to the global financial crisis, both import and export of environment-related equipment fell sharply.

Table 4 compiles the amount of environment-related equipment import and export in Taiwan, including the growth rate and the percentage of the industry from 2006 to 2012. In recent years, environment-related equipment imported accounts for 0.16% of the total annual imports of Taiwan. And environment-related equipment exports accounts for about 0.12% on average.

Table 4: An Overview of Taiwanese Environment-related Equipment Trade Volume, 2006-2012

Unit: thousand NT\$; %

	Total imports of environment-related equipment (A)	Annual growth rate	Total exports of environment-related equipment (B)	Annual growth rate	Country's total imports (C)	Country's total exports (D)	The proportion of total imports (A/C)	The proportion of total exports (B/D)
2006	9,736,430	-	7,719,372	-	6,604,336,706	7,279,319,454	0.15%	0.11%
2007	11,828,710	21.49%	8,869,751	14.90%	7,211,790,352	8,087,933,801	0.16%	0.11%
2008	10,636,476	-10.08%	10,552,500	18.97%	7,551,085,183	8,010,375,849	0.14%	0.13%
2009	8,467,571	-20.39%	9,053,140	-14.21%	5,757,179,343	6,708,883,860	0.15%	0.13%
2010	13,329,112	57.41%	11,267,615	24.46%	7,943,487,728	8,656,831,128	0.17%	0.13%
2011	14,349,677	7.66%	11,718,013	4.00%	8,280,368,637	9,041,591,432	0.17%	0.13%
2012	13,698,191	-4.54%	11,875,150	1.34%	8,021,457,258	8,899,963,477	0.17%	0.13%

Source: This Study from the Republic of China Customs Statistics database.

3. A Survey on Environment-related Enterprises in Taiwan

We conducted a survey on environment-related enterprises in Taiwan to identify key issues about this industry. The targeted enterprises for survey are all of 5,927 enterprises under registration but excluding those with false address in database. Those enterprises are mainly those manufacturers in the business with environment and energy-related industry, more focused on the environmental protection industry and green energy industry. After further selection, questionnaires were sent

Table 5: The Characteristics of Environment-related Firms

Sectors	Sub-Sector	Number of firms surveyed	Subtotal
Environment-related equipment industry	Environment-related equipment manufacturing	42	48
	Environmentally materials	6	
Environment-related services	Recycling	14	126
	Environmental testing services	10	
	Wastewater treatment	15	
	Waste treatment	16	
	Environmental engineering and technical consultancy	50	
	Pest control	12	
	Remediation	2	
	Energy technical services (ESCO)	2	
	Environment-related verification services	2	
	Environmental management technology	3	
Green energy industry	Refrigeration and air conditioning	12	38
	Solar photovoltaic	9	
	Biofuel	3	
	Wind power	2	
	LED lighting photoelectric	6	
	Hydrogen and fuel cell	1	
	Energy information and communication	4	
	Electric cars	1	
Total			212

Source: the study findings.

to 1,700 firms. The reply rate is 12.7%. The questionnaires were more completed by finance and accounting (46.3%) and business owners or managers (33.2%). Those companies who completed the survey can be classified by their business characteristics in Table 5.

Overview on Manufacturers' Operation

Most of enterprises are more focused on Taiwan's domestic market (193 of 212 enterprises). Very few enterprises have exporting experiences: only 10 enterprises exporting to China, 2 to Japan, 1 to Korea, 3 to South Asia, 1 to North America, 5 to Europe and 1 to Ease Europe. The others did not answer the question.

The net incomes of those enterprises surveyed are relatively low, only 4% of them earning 16% of net profit rate or above, 33% of them earning 13% to 15% of net profit rate, 10% of them earning 7 to 12% of net profit rate, 9% of them earning 4 to 6% of net profit rate, and 30% of them earning 3% of net profit rate or under. There are 212 or 14% of enterprises are under 0 profit.

In addition, most of enterprises (76%) do not invest on environment-related research and development. Also most of enterprises (75%) have no intention to invest on environment-related goods and services in the future.

Difficulties and Needs in Operation

In operation, the enterprises have encountered many issues or difficulties. 37% of the enterprises think intense competition in the domestic market is the primary difficulty faced by the enterprises. Also 24% of the surveyed enterprises need more assistance from government. 17% of the enterprises think regulations and supporting measures are not enough while 15.5% are in the need of financial capital.

The need for market and bidding information is ranked number one by enterprises (33%). Other types of information needed by enterprises include the subsidy measures for R&D (25.4%), low-interest loan (17%) and training opportunities (14.6%). 13.6% of those enterprises also need advanced technology from abroad and 11.8% need the opportunities to expand their market globally.

Willingness to Invest

By the enterprises surveyed, solar photovoltaic industry is most preferred investment (10 of 212 enterprises), following by energy saving/green building technology (8 of 212). Also energy saving services (ESCO), environmental consulting services and LED lighting manufacturing are generally preferred (7, 6 and 6 of 212 enterprises respectively).

Considering the amount of investment, about 50% of the enterprises are willing to invest NT\$15 million or less while only 13% of the enterprises are willing to invest more than NT\$15 million in the future

4. Conclusions

The purpose of this study is to investigate in the market performances of Taiwan's environmental related industries, whether, under the trend of green economy, they have international competitiveness in the global market. In addition, we intend to investigate in the major market barriers they face and governmental assistances they need.

Taiwan has around 7,000 environmental related companies, including 450 pollution abatement equipment companies, 1,400 resource management companies, and 5,000 environmental service companies. The industry production values are not high, compared to the most of Taiwanese industries. However, resource management companies, including water resource management and recycled material production, are growing fast with production value around NT\$ 107 billion per year. Pollution abatement equipment production value is NT\$ 35 billion per year, and the value of environmental service industry is NT\$ 115 billion per year.

This study compiled the census data from Taiwan EPA and DGBAS survey during the targeted years. The study found that Taiwan's environmental related businesses are small in terms of the market size and more focused on the domestic market. Expanding the international market for them is not easy. Although green technology competitiveness of Taiwan is not bad compared to the most countries, the production cost cannot compete with those countries with large market scales. In terms of the market barriers they face and the assistance they need, government should focus on establishment of more green policies, e.g., green certification, to promote their green supplying capacity and provide industries with financial assistance. The industries not only need the information of international green regulations and public procurements, but also financial measurements, such as loaning, and overseas demonstrating opportunities, and assistances to compete against the other countries' competitors.

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