

## CHAPTER TWO

### Background: Development of Taiwan IT industry and early pollution incidents.

Table One<sup>1</sup> World Market Shares 1982-2001

Sales figures are in \$million

Shares in percentage

Market	America	Europe	Japan	Asia Pacific	Total	Market	America	Europe	Japan	Asia Pacific	Total
<b>1982</b>						<b>1992</b>					
Sales	6259	2998	3985	920	14162	Sales	18410	11470	19396	10588	59864
Shares						Shares					
America	88.7%	54.6%	10.1%	42.3%		America	70.2%	47.3%	13.5%	42.9%	
Japan	10.4%	7.1%	89.9%	25.4%		Japan	20.8%	15.3%	84.8%	37.1%	
Others	0.9%	38.3%	0%	32.3%		Others	9%	37.3%	1.7%	20%	
<b>1983</b>						<b>1993</b>					
Sales	7763	3319	5534	1326	17942	Sales	24744	14599	23798	14168	77309

<sup>1</sup> Stats: World market sales and shares 1982-2001. Semiconductor Industry Association. 1 Apr. 2004  
<[http://www.sia-online.org/pre\\_stat.cfm?ID=180](http://www.sia-online.org/pre_stat.cfm?ID=180)>

Shares						Shares					
America	85.7%	56%	10.8%	41.6%		America	67.5%	50.4%	15%	40.6%	
Japan	12.9%	9.3%	89.2%	25.9%		Japan	23.1%	13%	82.1%	35.6%	
Others	1.3%	34.6%	0%	32.5%		Others	9.4%	36.6%	2.9%	23.8%	
<b>1984</b>						<b>1994</b>					
Sales	11599	4738	8034	1826	26195	Sales	33562	19736	29406	19174	101878
Shares						Shares					
America	83.2%	55.3%	11.2%	40.1%		America	64.6%	50%	17.1%	39.5%	
Japan	14.3%	11.6%	88.8%	25.8%		Japan	23.4%	15%	77.9%	37.3%	
Others	2.3%	33.1%	0%	34.1%		Others	12%	35%	5%	23.2%	
<b>1985</b>						<b>1995</b>					
Sales	8091	4541	7598	1530	21760	Sales	46998	28199	39667	29540	144404
Shares						Shares					
America	85.7%	53.9%	8.5%	39.7%		America	61.3%	47.1%	17.9%	33.6%	
Japan	11.8%	9.9%	91.4%	26.9%		Japan	22.6%	18%	76%	34.9%	
Others	2.5%	36.2%	0.1%	33.4%		Others	16.1%	34.9%	6.1%	31.5%	
<b>1986</b>						<b>1996</b>					
Sales	8607	5373	10695	2291	26966	Sales	42679	27561	34175	27550	131966

Shares						Shares						
America	82.8%	46.8%	8.6%	37.8%		America	67.7%	51.9%	20.2%	39.3%		
Japan	13.9%	11.17%	91.2%	37.5%		Japan	19%	16%	74.5%	30.7%		
Others	3.3%	42.1%	0.2%	24.7%		Others	13.3%	32.1%	5.3%	30%		
<b>1987</b>						<b>1997</b>						
Sales	10359	6241	13031	3756	33360	Sales	45850	29089	32079	30184	137203	
Shares						Shares						
America	79.7%	45.9%	9.6%	34.6%		America	73.8%	56.7%	23%	43.6%		
Japan	16.6%	13.05%	90.2%	44.1%		Japan	12%	10%	70%	25%		
Others	3.7%	41.1%	0.2%	21.3%		Others	15.2%	33.3%	7%	31.4%		
<b>1988</b>						<b>1998</b>						
Sales	13768	8253	18658	5624	46303	Sales	41432	29406	25921	28853	125612	
Shares						Shares						
America	70.5%	44.9%	10.2%	32%		America	75.3%	57%	22.6%	45.9%		
Japan	24.3%	19.47%	89.5%	41.5%		Japan	11.3%	10.9%	69.7%	24.9%		
Others	5.3%	35.7%	0.3%	26.5%		Others	13.4%	32.1%	7.7%	29.3%		
<b>1989</b>						<b>1999</b>						
Sales	15049	9040	19575	5997	49661	Sales	47478	31881	32835	37184	149379	

Shares						Shares						
America	67.3%	44.2%	10.1%	37.2%		America	71.2%	57%	21.1%	47.8%		
Japan	26.6%	19.02%	88.1%	35.4%		Japan	11.7%	12.2%	71.5%	27.1%		
Others	6.2%	36.8%	0.9%	27.4%		Others	17.1%	30.8%	7.4%	25.1%		
<b>1990</b>						<b>2000</b>						
Sales	14445	9599	19563	6911	50518	Sales	64071	42309	46749	51264	204393	
Shares						Shares						
America	72.1%	46.2%	12.3%	40.7%		America	70.2%	55%	20.4%	47.3%		
Japan	21.2%	14.81%	86.5%	35%		Japan	11.6%	13.8%	70.3%	21.6%		
Others	6.7%	38.9%	1.2%	24.3%		Others	18.2%	31.2%	9.3%	31.1%		
<b>1991</b>						<b>2001</b>						
Sales	15376	10114	20934	8181	54065	Sales	35778	30216	33148	39820	138963	
Shares						Shares						
America	69.9%	45.2%	12.5%	42.7%		America	72.5%	54.6%	22.8%	53.1%		
Japan	19.7%	14.7%	86.1%	33.9%		Japan	11.1%	14.3%	70.3%	18.6%		
Others	10.4%	40.2%	15.1%	23.3%		Others	16.4%	31.1%	6.9%	28.3%		

## Development of IT industry in Taiwan

### 2.1 Development of IT industry

After the World War II, Taiwan economy was devastated by rampant inflation, low productivity and lack of resources. In the 1950, Korean War break out, U.S. shift majority of foreign assistance program from Europe to the U.S. friendly countries in Asia like. Between 1955 and 1975 Asia received more than half of all U.S. Bilateral Assistance, as can be seen from Table Two. The foreign aid went to countries where U.S. has strategic interests like South Korea, Taiwan<sup>2</sup> and South Vietnam. With foreign aid and series of reform, Taiwan's Net Domestic Product was back to the prewar level. During the 50s, U.S. provided foreign aid for building of infrastructure, at same time Taiwan received production technology from both U.S. and Japan for the development of the economy.

Table Two<sup>3</sup> U.S. Regional Aid as a Share of All Bilateral Aid (In percent)

Region	1955	1965	1975	1985	1995
Africa	1	5	6	11	12
Asia	54	52	51	14	6

<sup>2</sup> Import and export statistic year book of China.

US aid totaled over \$4 billion from 1951 to 1965, accounted for over 40% of capital formation in the 1950.

<sup>3</sup> Wilkins, Mira. *The maturing of multinational enterprise: American business abroad from 1914 to 1970*. Cambridge, Mass.: Harvard University Press, 1974.

Europe/NIS	36	13	5	14	18
Latin America	3	20	11	15	9
Middle East and North Africa <sup>a</sup>	6	10	27	45	55

From Congressional Budget Office based on data from the Agency for International Development.

NOTE: NIS = newly independent states (of the former Soviet Union).

a. The Agency for International Development reports these data under a category called Near East.

Traditionally Taiwan has been export orient, Taiwan had adopted import substitution policy in the 50s. By 1953, Taiwan started to actively encourage foreign investments, so Taiwan could receive much needed capital and technology-know-how from international cooperation. The trade policy had shift from import substitution to the export promotion, Taiwan's economy under control of the government, government focuses resource in labor-intensive industries<sup>4</sup>. At same time, government simplified the exchange rate, relaxed the import restriction, implement the Statute for Encouragement of Investment, and the Statute of establishing and management of export processing zone. In the 50s, the agricultural export exceeded the industrial export, however by 1962<sup>5</sup>, the industrial export exceeded the agriculture export for the

<sup>4</sup> Mostly in the agriculture sector in the 50s, as most export was in food stuff, later began to shift to the low skill labor intensive industries, as can be seen from Table Three.

<sup>5</sup> KMT. Chinese KMT over the past one hundred years. Taipei: KMT History Committee, 1994. In 1960, the high way that connects the East and West of Taiwan completed. In 1961, the Kaohsiung export-processing zone was established.

first time. In the beginning, the government didn't really seem to know which industries to focus the resources on,<sup>6</sup> with help of the American experts, government steer the course of the economy to the heavy industries like steel and the textile, rubber and plastic industries in the 70s. The two areas that were specially developed for industrial production were Taipei county and Kaohsiung. Especially in Taipei County, the evolutions of Taiwan industrial production can be see here. In the 50s the textile manufacture that come with Nationalist party already started the textile production facility there. And by the 60s, in accordance with export promotion policy food processing, rubber, and electronics industries become the promoted industries. And in the 80s and 90s, it was electronic machineries, high tech semiconductors. The growth of the semiconductors was especially astonishing for the Asia Pacific, as can be seen from Table One, in which the sales grows from the \$ 920 million in 1982 to the \$ 39820 million in 2001, at growth rate around 43, and there is significant rise in market shares of Asian Pacific in American, Japanese and European markets.

Table Three Total Export from 1959 to 2003 (figures in NTD)

Year	Total Export	Vegetable and	Chemicals	Textile	Electrical

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In 1962, Third Four Year Economic Construction Plan's strategy was to promote export, from 1961 to 1964 export increase on average 31 percent per year.

<sup>6</sup> This can be seen in the provision three of the Statute for Encouragement of Investment, provision three listed the industries government encourage investment in, which is basically manufacturing in all industries.

		Foodstuff			Equipment and Machinery
1959	5,708,248,029	59.39%	3.53%	5.33%	-
1960	5,965,664,508	50.79%	-	6.99%	-
1970	57,131,722,293	11.57%	-	25.84%	3.79%
1971	79,906,424,136	12%	-	28.47%	3.70%
1972	116,648,491,000	10.49%	-	27.92%	19.26%
1973	167,383,406,000	-	-	-	-
1974	209,675,481,000	10.59%	1.67%	26.28%	21.29%
1975	201,467,867,000	-	-	-	-
1976	309,912,598,000	6.72%	1.22%	27.37%	18.56%
1977	355,238,940,000	6.39%	-	23.23%	18.95%
1978	468,509,299,000	4.34%	1.30%	22.23%	19.19%
1979	579,298,546,000	3.61%	1.42%	21.39%	19.64%
1980	712,195,194,000	3.39%	1.54%	20.85%	20.43%
1981	829,756,002,000	2.78%	1.30%	21.16%	21.08%
1982	864,247,693,000	2.86%	1.45%	20.76%	19.93%
1983	1,005,422,452,000	2.19%	1.35%	18.94%	21.91%

1984	1,204,696,663,000	2.00%	1.36%	19.22%	23.85%
1985	1,223,018,567,000	1.70%	1.38%	19.56%	23.59%
1986	1,507,043,655,000	1.55%	1.52%	18.36%	24.63%
1987	1,707,607,642,000	-	1.44%	16.90%	27.39%
1988	1,731,804,014,000	-	1.62%	15.33%	30.25%
1989	1,747,799,246,000	-	1.60%	15.60%	32.95%
1990	1,802,781,059,000		1.91%	15.31%	34.42%
1991	2,040,784,970,000	-	2.06%	15.75%	34.52%
1992	2,047,961,998,000	-	2.17%	14.53%	36.45%
1993	2,239,031,654,000	-	2.28%	14.19%	39.25%
1994	2,456,010,977,000	-	2.58%	15.05%	40.62%
1995	2,949,579,951,000	-	2.90%	13.98%	43.78%
1996	3,176,624,196,000	-	2.80%	13.51%	46.34%
1997	3,481,685,084,000	-	2.68%	13.61%	48.43%
1998	3,693,268,791,000	-	2.58%	13.16%	49.97%
1999	3,917,446,187,000	-	2.69%	11.66%	52.75%
2000	4,616,301,199,000	-	2.73%	10.25%	55.69%
2001	4,137,742,391,000	-	3.37%	10.28%	54.41%

2002	4,507,506,099,000	-	0.70%	6.70%	64.20%
2003	4,952,475,993,000	-	3.90%	8.20%	62.20%

From: 中國進出口貿易統計年刊 1959-1988

中華民國台灣地區進出口貿易統計月報 1989-2003.

Note: 1. The trade monthly did not provide some of the data, therefore denote with -.

2. The Electronic Integrated Circuits and Automatic data processing machines are included in the Electric Equipment and Machinery

As far back as the 1950s, Taiwanese government officials were interested in bring the electronic production to Taiwan, in 1957 a meeting was hold by Stanford University to encourage foreign direct investment from U.S private firms and this meeting was attended by Government official K.T. Lee<sup>7</sup>. In 1961, specialists were hired from Stanford Research Center to assist in research opportunity to invest in developing industry. During 60s government promote industries such as textile, plastic, consumer

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<sup>7</sup> The road to modernizing Taiwan-K.T. Lee. 2 Apr. 2004 <http://ktli.sinica.edu.tw/ktli1.html>  
K.T. Lee was the fiscal policy expert and godfather of Taiwan technology industry. In 1950s, he had an important role in the industrialization of Taiwan. He was the Secretary of I.C.A. Committee, which was responsible for distribution of the I.C.A. At same time he was a member of various economy and industrial planning commissions. In 1965, he became the Minister of Economic, his achievement during this period was establishing of Export Processing Zone, population control, technology cooperation between U.S. and Taiwan, encourage private investment, and increase skill workers. In 1969, Lee became the Financial Minister, he improved financial situation. By 1976, Executive Yuan established the Applied technology R&D team, Lee was the convener, and he also set up technology consultant team to improved specific technologies in industries such as electronic, computer information, biotech etc.

electronics, as can be see from Table Three those industries later accounted for more than 50% of export, and textile industry became more and more uncompetitive. At same time private investment from Silicon Valley was still encouraged, by the government officials, numerous speech about investment opportunity in Taiwan was give at Santa Clara. During 70s cost of labor increase, and relative cost of capital fall, in order to maintain our competitiveness, government encourage industry shift from labor intensive production to capital intensive production, and improve the quality control. By 1976, Executive Yuan (行政院) instructed the Ministry of Economic Affair (經濟部), Ministry of Education (教育部) and National Center Science Council (行政院國家科學委員會) to co-operate in establishment of the Science Industrial Park, since production of semiconductor is capital intensive, and Silicon Valley has been very successful example. Executive Yuan set up the Science Industrial Park Preparatory Team in the following year, and Hsinchu was chosen as site of Industrial Park. In 1979, President announced the “Management Regulations of Science Industrial Park”; a year later Hsinchu Science Industrial Park was officially open. The Park was established and managed under many institutes, the National Science Council (行政院國家科學委員會) was responsible for running of the Park, Industrial Technology Research Institute (工業技術研究院) assisted firms with technology innovation, or firms would cooperate with foreign firms in research and

development and the nearby universities (National Chiao Tung 交通 University, Tsing Hua 清華 University) provided trained skill technician. And seven companies were established in the Park, by 1996 number of companies reached 200, by 2001 there were 335 companies in the park (Table Four), and almost half of those were semiconductors.

In the late 80s, ideal of turning Hsinchu City into a techno-city<sup>8</sup> take hold, the aim was to improve the development of Hsinchu City as whole. The park was design to satisfy the need of the high level technicians and investor, it was to be an area offered comfortable working, living and investing environment. Therefore it has all the facilities occupants of the Park would need. Under this design, the elite<sup>9</sup> of the Park has little contact with locals, and the better infrastructure and public facilities in the Park resulted in the unequal development between Park and local. This has widen the gap between workers in Park and the locals outside of Park, plus the fact that the Hsinchu Science Industrial Park do not fall under the management of Hsinchu City or County, locals are hostile and distrust firms in the park. Especially when there are

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<sup>8</sup> Chan, L. C. "*High tech fantasies: Hsinchu Science-based Industrial Park and Local Development.*" Thesis. National Taiwan Normal University, 2001.

Techno-city has not been specifically define, one of it's meaning could be the virtual digital space construct by Internet related software or hardware. And it can also represent city that is create by gathering of science and production technology induced by research institute. According to Castells & Hall, techno-city does not participate directly in the manufacturing process; it is a specific area for scientific research.

<sup>9</sup> Understand Park. Hsinchu Science Industrial Park. 3 Apr. 2004 <

<http://www.sipa.gov.tw/1/in1/index-in1.htm>>

In 2002, an estimate 98,685 employees in the Park, 40% of which has Bachelor degree or above, 66% education level is college and above. 4318 people graduated from overseas university.

environmental problems, it is difficult for both side to reach consensus because of lack of trust on the side of local residence and lack statutory regulations to regulate firms behavior.

Table Four Number of Firms and Yearly Turnover of the Hsinchu Science Industrial Park

Unit: Billion of NTD

Year	Number of firms in the Park	Turnover per year	Working Capital	Capital
1981	17	N/A	0.09	0.07
1982	26	N/A	0.16	0.12
1983	37	30	0.24	0.2
1984	44	95	0.44	0.32
1985	50	105	0.57	0.41
1986	59	170	0.67	0.57
1987	77	275	1.74	1.06
1988	94	490	2.17	1.58
1989	105	559	3.54	2.82
1990	121	656	5.17	4.27

1991	137	777	6.36	5.51
1992	140	870	7.14	6.28
1993	150	1,290	8.24	6.69
1994	165	1778	11.67	9.35
1995	180	2,992	19.39	14.77
1996	203	3,181	40.84	25.85
1997	245	3,996	56.49	37.57
1998	272	4,550	66.63	51.06
1999	292	6,509	73.47	56.6
2000	289	9,293	92.23	69.45
2001	312	6,625	113.8	85.88
2002	334	7,054	122.84	91
Average growth rate.	15.24	33.28	40.88	40.51

From 新竹科學園區整體發展及相關設施設置之研究<sup>10</sup>

The average growth rate Hsinchu Science Industrial Park is very impressive, and the sharper increase was at 1988, 1995, and 1999, as can be seen in Table Four. By 2003,

<sup>10</sup> ROC. Urban Planning Society. Study of development and construction of related infrastructures of Hsinchu Science Industrial Park. ROC: Taipei City Internal affairs Urban Planning department.

the production value of the Park reach NTD one trillion, Hsinchu Science Industrial Park is the proverbial chicken that laid the gold egg. The reason for the sharp increase at end of the 90s could be the price war began by Compaq, which cause the manufacturer start to outsource it's production, as can be seen in Table One the market share of the Asia Pacific reaches a peak in 1997, at that same year Compaq purchase \$40 billion worth of goods and Dell purchase \$15 billion worth of hardware in Taiwan. With changing of industrial structure from computer related industry to the semiconductor industry by the late 90s, this had enlarged the demand on environment in terms of usage of water, electricity and land. Large amount of water and chemical are use in the production of semiconductor, after water go through the semiconductor production process, it has become contaminated. If this water was release into the rivers without proper wastewater treatment, rivers and land become contaminated as well causing harm to the people as well as environment.

## **2.2 Pollution incidents**

Table Five<sup>11</sup> Pollution incidents in Hsinchu area

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<sup>11</sup> From this table we can see that the pollution at Hsinchu are mostly from the government encourage industries, from the earlier chemical industries to the semiconductor industries.

Date	Name of Polluter	Industry	Pollutant
1963	Hsinchu Chemical Co (新竹化工廠)	Chemical (化工)	Poisonous gas
1982	Lee Chang Yung Chemical Industrial Corporation, Hsinchu City (新竹市李長榮化學工業股份有 限公司)	Chemical (化工)	Smoke, waste water
1983	Re Fone Pesticide Factory (新竹縣瑞豐農藥廠)	Pesticide (農藥)	Miasma, waste water
August, 1983	Hsinchu Chemical (新竹化工)	Chemical (化工)	Industrial Waste, waste water
May, 1985	Bey Ke Chemical Co (新竹縣倍客化學公司)	Pesticide (農藥)	Miasma, waste water
March, 1985	Headway Chemical Co (新竹縣展宇化學公司)	Chemical (化工)	Industrial Waste, miasma
October, 1985	Chyuan Sheng Industrial Metal Co. (新竹縣泉盛 金屬工業公司)	Metal (金屬)	Smoke
March, 1986	Cheng Nong Pesticide Factory (新竹縣政農農藥 廠)	Pesticide (農藥)	Pesticide
April, 1986	Chia Shen Farm Industry Co. (新竹縣嘉莘畜產 公司)	Animal Industry (畜 產)	Industrial waste, waste water
October, 1986	TaiShan Chemical Co. (新竹縣台森化工廠)	Chemical (化工)	Waste water
April, 1986	TaiYuan Textile (新竹市台元紡織廠)	Textile(紡織)	Waste water
December, 1987	Hsinchu Chemical (新竹化工)	Chemical (化工)	Smoke
1988	Hsinchu Industrial Park (新竹工業區)	Industrial Park (工)	Waste water

		業區)	
January, 1988	Fong Nong Pesticide Factory (新竹瑞豐農藥廠)	Pesticide (農藥)	Poisonous gas
February, 1988	Lee Chang Yung Chemical Industrial Corporation (新竹市李長榮化工)	Chemical (化工)	Waste water
August, 1988	Pollution of Jia Dong River (新竹縣茄苳溪水污染案)	Industrial Park (工業區)	Waste water
February, 1989	Lee Chang Yung Chemical (新竹市李長榮化工)	Chemical (化工)	Waste water
March, 1989	Shin Ke Corporation (新竹縣信克工司新豐廠)	Chemical (化工)	Smoke
March, 1989	Tai Ru Ge Chemical Fibre (新竹縣太魯閣化纖)	Chemical Fibre (化纖)	Waste water
December, 1989	Tian Long Paper Manufacturing Factory (新竹天隆造紙廠)	Paper (造紙)	Waste water)
January, 1990	Chia Shen Farm Industry Co. (新竹縣新豐嘉莘畜牧場)	Animal Industry (畜牧)	Waste water
November, 1990	Zhi Chun Co. (新竹縣直春公司)	Chemical (化工)	Leakage of oil
July, 1991	Tai Yuen Textile (新竹縣台元紡織染整廠)	Textile (紡織)	Waste water
August, 1991	Tai Shen (新竹縣台森企業)		Leakage of preserves
March, 1992	Far East Chemical Fibre (新竹縣遠東化纖)	Chemical Fibre (化纖)	Coal ash

September, 1992	Cheng Nong Pesticide Factory (新竹縣正農農藥廠)	Pesticide (農藥)	Waste water
September, 1997	Hsinchu Science Industrial Park Administration (新竹科學園區管理局)	Science Industrial Park (科學園區)	Waste water Ke Zi Hwu River (廢水柯子湖溪)
1998	RCA	Electronics (電子)	Waste water (廢水)
August, 1998	Hsinchu Science Industrial Park Administration (新竹科學園區管理局)	Science Industrial Park (科學園區)	Discharge of wastewater through sewage system
November, 1999	Space Shuttle Hi-tech Co. Ltd (太空梭高傳真電線工業股份有限公司)	Tel-communication (通訊)	Waste water
December, 1999	UMC (聯電五廠)	Semiconductor (半導體)	Environmental assessment
March, 2000	Unknown	Science Industrial Park/Presbyterian Bible College (聖經書院排水系統)	Miasma, waste water
2000	Unknown	Science Industrial Park/Long Shan Community (龍山社區)	Air pollution

2000	Unknown	Science Industrial Park/Gao Fong, Shian Gong, Da Chi Village (高峰、仙 宮里、大崎村)	Air pollution
May, 2000	UMC (聯華電子)	Semiconductor (半 導體)	Soil contamination
July, 2000	Sheng Li, Eternal Chemical Co. (昇利，長興化 工)	Waste Treatment (廢物處理)	Waste Solvent
July, 2000	Unknown	Science Industrial Park/ I Ming, Yi Ming Street (愛 民、義民街)	Air pollution
October, 2000	Unknown	Science Industrial Park/ Waste water treatment facility (廢水廠)	Air pollution, waste water, miasma
November, 2000	Unknown	Science Industrial Park/Shian Shui	Discharge of waste water

		community river (仙 水里小河)	
December, 2000	Macronix International Co., Ltd (旺宏電子)	Semiconductor (半 導體)	KeYea River pollution (客雅 溪污染)
2001	Opto Tech (光磊)	LED	Air pollution
2001	UMC, Winbond Electronics Corporation, Macronix International Co., Ltd (聯電、華邦、旺宏)	Semiconductor (半 導體)	Air pollution
2001	Unknown	Science Industrial Park/Gao Tsuey Road (高翠路)	Air pollution
2001	Unknown	IC	Air pollution
2001	Hsinchu Science Industrial Park Administration (新 竹科學園區管理局)	Science Industrial Park/Spring(靈泉 試茗)	Pollution of spring
April, 2001	Tyntek Corporation (鼎元光電)	Semiconductor (半 導體)	Discharge of waste water
May, 2001	Unknown	Science Industrial Park (科學園區)	Death of fishes in Long En River (隆恩圳魚群暴斃)
May, 2001	Unknown	Science Industrial	Miasma

		Park/Community(竹 村三路/科園社 區)	
June, 2001	Waste water treatment facility 新竹科學園區管 理局污水處理廠	Science Industrial Park	Leakage of waste water, air pollution
August, 2001	Traffic	Bao Shan Township (寶山鄉北埔路)	Traffic congestion
May, 2003	Unknown	Science Industrial Park (科學園區)	Waste water discharged into Long En River (廢水隆恩圳 魚群暴斃)
September, 2003	Unknown	Unknown	Leakage of waste water
January, 2004	Chinese Petroleum Corp. (中油)	Energy (能源)	Leakage of oil

From 環境保護白皮書 1989, 新竹科學園區環境保護小組 90, 91 年度報告, 八十九年會議決議事項追蹤表

The construction of Hsinchu Science Industrial Park consisted of three periods, and total land appropriated was 605 hectares. The Science Industrial Park is in the east of the Hsinchu, and it's only obvious that many supporting industries are in this area as well. The production value of industries and commercial of east is on average 84.1% of total Hsinchu production. The transport, storage, real estate and energy

industries like oil, coal and liquid gases clustered in the northern part of Hsinchu. The production value of this two area is 93.8% of total Hsinchu production, and the industrial production value is 56.4% of Taiwan production. Hsinchu Science Industrial Park had brought economic prosperity to Taiwan at times of economic downturn, but it's not without environmental cost. In the report published in 2000<sup>12</sup>, the areas that had suffered environmental contamination problems are in the east of Hsinchu as well as the Bao Shan Township (寶山鄉), which is right next to the Science Industrial Park. Because of the unbalanced development between Park and outside of the park, infrastructures of local townships and villages are not up to deal with the pollution, but the local residence still plays an important role in detecting foul-play, and in influencing the result of arbitration.

### **2.2.1 Early pollution incidents**

Although the Hsinchu industry has not been developed as early as Taipei county or Kaohsiung, the first recorded pollution case since industrialization of Taiwan in the 60s occurs in Hsinchu. During the fifties the import of the chemical was around 10 to 20 percent, with the import substituting policies, the chemical industry has been one of the government encourage industries<sup>13</sup>. The polluter was Hsinchu Industrial Chemical

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<sup>12</sup> Hsinchu Science Industrial Park Environmental Protection Unit. 2000 meeting minute.

<sup>13</sup> In the 1974 amendment of the Statute for Encouragement of Investment, provision ten especially

Factory (新竹化工廠), who was producer of the Coking products. Due to the wear and tear of the Coke Oven, Carbonizing Furnace was cracked and thick smog severely polluted the surround areas, endanger the health and lower living standard of the local residence. The local residence has been report pollution since 1963, but they were not been take seriously, this was perhaps because of the fact that economy were just taking off government were intended on promoting industrialization and less environmental conscious at that time. By the 1986, Coking Industry was classified as serious environmental polluting industry by the Taiwan Provincial Government (台灣省政府), and in 1987 the representatives of six villages had file complaint with Executive Yuan and Environmental Protection Agency(行政院環保署)was instructed to mediate the dispute. Although Hsinchu Industrial Chemical's new pollution prevention equipment was judge to be effective by monitoring team<sup>14</sup>, but after the long dispute with the company, local residence were distrustful of the company and government. In 1989, Hsinchu Industrial Chemical Factory had to shut down the plant. However this is not the end of the story, recent study had show that the site of the Hsinchu Industrial Chemical Factory has been severely contaminated<sup>15</sup>. The soil at the

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mentioned the chemical industries to be encourage and the tax from this industry was not to be above 22 percent.

<sup>14</sup> Members of the monitoring team consist of Professors from National Tsing Hua University, National Chiao Tung University, National Taiwan University, and National Central University.

<sup>15</sup> Petts, Judith, Tom Cairney, Mike Smith, *Risk-Based Contaminated Land Investigation and Assessment*. England: Wiley & Sons Ltd, 1997.

The definition of contamination is land so damaged by industrial or other development that it is incapable of beneficial use with out treatment.

site contain substances such as Benzene, Methylbenzene, and Xylene, those substance can cause cancer. From past research conduct by EPA, over fifty people die of respiratory disorder, and upper aero-digestive cancer over the last 15 years. The evidence suggest that aero-digestive cancer can develop more than 15 years after exposure, latent period can be up to 20 years or more. This has serious implication in the land usage, as well as responsibility of seller and buyer of the land, and extent of the legal duties of the polluter.

Even though there had been serious pollution problem, it was not until 1987 that first Non Governmental Organization against industrial pollution was established in Hsinchu, the direct cause of it was the case of Lee Chang Yung Chemical Industry Corporation (李長榮化學工業股份有限公司). By 1982, LCY Chemical Industry Corporation in the east of Hsinchu City began its production with Methylanine and Dimethylformamide. During the production process, the polluted water was discharged into the Long En (隆恩) and Jiou Li Pu (九里埔圳) rivers; at same time the unpleasant odor was permeating the nearby villages. Although the local residences reported situation to Department of Health, but result of the test was always within the legal limit. LCY still continue with the production. As the seasonal wind blow the stink of Dimethylformamide to the campus of National Chiao Tung (交通) and Tsing

Hua(清華)University, some three hundred professor present a round robin to Premier of the Executive Yuan, but to no avail. In 1983, the LCY plant was shut down because the discharged wastewater was above the legal limitation and as it was under the legal limit, plant received permission to started operation again. The breakdown of the High Pressure Valve in 1986 cause leakage of Dimethylamine, the local residences suffer loss and injuries as consequence of this incident, and the Hsinchu City government shut down the plant again. In the following months, because of the lack of trust on the part of local residence and lack of good faith on the part of the LCY, local residences went on a protest against the company, and they also form picket to surround the plant and this would carry on for some four hundred days. As LCY did not comply with the city regulations, they were fined the sum of NTD 300 000 a day for 4 consecutive days, but the plant keep operating because profit earned were higher than the fine, so LCY carried on with operation. In order to solve LCY pollution problem, protesters form a NGO call Hsinchu Public Nuisance Prevention Association (新竹公害防治協會). In the seventies, people become environmental conscious because of the seriousness of the environmental pollution, by the eighties the environmental protectionism raise it's head, and protesters employed self-helping in anti-pollution protest. At that stage the local residence made it clear that they will accept nothing but the reallocation of the plant, Hsinchu city government start to negotiate with the LCY

with the EPA and Provincial government as mediator. However LCY and Hsinchu city government unable to reach agreement, because LCY were willing to reallocate under the condition that the usage of land (site of the plant) could be change to agricultural use, and city government asked LCY to provide part of the land for public use without charge, but this was refused by LCY. City Government felt that LCY was not sincere since they did not specified as to how the profit from the change of the land usage would be feedback to the local residence. By this stage, the Provincial government has taken LCY side, agreed to the LCY's condition, and as to the city government's request provincial government felt that it is not in their jurisdiction. However by agreed to the LCY's condition provincial government had already unfairly exercising jurisdiction. As both side unwilling to compromise, situation had come to a stand off, however as the leakage of Dimethylamine occurred again, prompt both side to come to some sort of agreement. In the final arbitration it was decided that LCY was to shut down the plant, transported all stored stock, raw material out of premises, and no raw material were allow in the premises. LCY signed the agreement to the above condition, and city government promised to solve any man made interruption, and drop the suit against the LCY.

However this incident is not the last pollution cause by LCY. In 2000, during unloading of shipment, because of negligence of LCY workers the poisonous

chemical was spilt, and at the time strong wind had cause the poisonous gas to be spread around the Chi Jin (旗津) area, where LCY has another production facility, which had cause the poisoned of numerous people, and endanger the public health<sup>16</sup>.

In the investigation conducted by Kaohsiung City EPA, evidence showed that the culprit was LCY, and a fine of NTD 1 million was given to LCY. However this decision was appeal by the firm in the Kaohsiung High Court, and it was believed that EPA do not have sufficient reason to imposed fine, therefore Court rule in favor of LCY. This decision was extremely unfair, the LCY was a company with history of environmental offenses, during the trial their blemish record was over look, and for the second time literally got away with murder, it does make people ponder the fairness of the Justice system.

All in all, with implicit support of the central government, LCY had got what they wanted without compromising, and the local government came out worst off from the bargaining. Central government had undermined the local government authority in dealing with environmental pollution by corporations. The land use control is to ensure the location of the possible polluted site was not a directed threat to the other activities. In this case it was highly possible that the soil of LCY site was contaminated, and by changing the land use to agricultural it has place residences at

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<sup>16</sup>Union Times 12 Dec. 2001. 4 Apr. 2004 <[http://163.32.127.2/~evvec/magazine\\_html/environment8-1.htm](http://163.32.127.2/~evvec/magazine_html/environment8-1.htm)>

further exposure to the chemicals, up to today there is no environmental evaluation done on the site of LCY plant and no research had been done on the effect of polluted site on the local population.

The cases of Hsinchu Industrial Chemical Factory and LCY had pretty much define government's attitude toward pollution. Hsinchu Industrial Chemical Factory had been causing pollution for over 20 years before government had interfered, and by that time the Coke industry was not new nor prosperous, rather it was a industry that were in the phase of fading out. Therefore once government had made up the mind about the future prospect of this particular industry decision was quickly made and factory was shut down. However the LCY was another matter altogether, the shut down of the Hsinchu production site was due to the persistence of the local residences and seriousness of the pollution. By the 90s LCY had produced chemicals for semiconductor production<sup>17</sup>, which makes it one of the important industry in the economy. Therefore the LCY had gotten of lightly, same as the Eternal Chemical Co.

### **2.2.2 RCA**

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<sup>17</sup> Company profile. LCY Chemical Industry Corporation. 2 Apr. 2004  
<<http://www.lcy.com.tw/tc/aboutUs.php>>

Table Six RCA history timetable

1970	RCA establish factories in Taoyuan and Northern Hsinchu
1986	Taoyuan and Northern Hsinchu facilities merge by GE
1988	Thomson purchase Taoyuan and Northern Hsinchu facilities
1991	Thomson discover that the production sites had been polluted by organic waste
1992	Thomson sold Taoyuan facility to Hong De and Northern Hsinchu facility to Chinese Electronics Company.  RCA officially shut down factory
June, 1994	Environmental Protection Agency holds a press conference to expose pollution at former RCA site.  EPA established RCA Groundwater Contamination Investigation Task Force
June, 1995	EPA agreed that GE did not need to conduct environmental risk evaluation, only need to restore the soil and  ground water to certain extent
1996	Thomson GE began the restoration process
April, 1998	Taiwan provincial Urban planning commission pass the plan to change land usage of RCA sites
June, 1998	The polluted underground of RCA can not be restored  Cancer epidemic in RCA worker
1998	RCA Occupational Cancer Workers Self Assisting organization established  Executive Yuan established "RCA Special Task Force"
November, 2000	The RCA workers organization meet with Head of the Council of Labor Affairs, to express their dissatisfaction  with the 3-year long research plan and the result of the second period research.

January, 2001	<p>The Executive Yuan special task force dismissed</p> <p>The RCA worker's organization and Taiwan Association for Victims of Occupational Injuries protest the action of the Executive Yuan and give full statement to the Legislative Yuan and Foreign Affairs.</p> <p>First meeting of the legal representative, and the Bona fides legal representative group was official established</p>
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From: RCA workers' occupational cancer Q&A<sup>18</sup>, Political and environmental analysis of hazardous waste and environmental regulation<sup>19</sup>

In the seventies, as the Taiwan's competitiveness fall, and with energy crisis economy experiencing slumps, government tried to steer economy towards new direction. As government decides to focus on IC industry, they started to search for firm to provide the technology needed. In 1974, government purchased the CMOS<sup>20</sup> technology know-how from RCA for almost five billion NTD, and 44 people were send to RCA to learn the everything from the IC production to the management of IC facilities and establishment of the IC plant, some of those 44 people were the heavy weight<sup>21</sup> in the semiconductor industry today.

<sup>18</sup> RCA Worker occupational cancer Q&A. Judicial Reform Foundation. 4 Apr. 2004 <[http://www.jrf.org.tw/reform/file\\_5\\_3.htm](http://www.jrf.org.tw/reform/file_5_3.htm)>

<sup>19</sup> Sheu, S. F. "*Political and environmental analysis of hazardous waste and environmental regulation.*" Thesis. National Cheng Ching University, 2001.

<sup>20</sup> CMOS. Webopedia. 4 Apr. 2004 <<http://www.webopedia.com/TERM/C/CMOS.html>> Complementary Metal Oxide Semiconductor technology is the dominant semiconductor technology for microprocessors, memories and application specific integrated circuits. CMOS has both Negative polarity and Positive polarity circuits, only one of the circuit types is on at any give time, CMOS require less power than chips using just one types of transistor.

<sup>21</sup> Huan, U. F. "Past Trainee of the RCA, Today's giants in semiconductor industry." Freedom electronic News. 26 Apr. 2004. 4 Apr. 2004

RCA is an America based company, which gain experience in shifting production site from its native America soil to the developing nation when it shift its production from Memphis to Ciudad Juarez. The RCA's move was in quest for the cheap and docile labor, as production was shift so was the environmental pollution. RCA was not known for its clean production or the pleasant working condition, one of the reasons for the Bloomington strike was for better working condition (Cowie, 68). And in the Mexico, they were caught dumping solvents into the water system (Cowie, 199), however as RCA carries a lot of political clot, and nothing come out of that incident. In Taiwan a similar incident to the Mexico had occurred, which show that the RCA had not just shift production to Taiwan, but also the pollution as well, and it had not just exploit the cheaper labor of the developing nations but natural environment as well.

In 1970, RCA established two production facilities<sup>22</sup>(table six) in Taoyuan and Northern Hsinchu, the capital at that time was 90 million NTD, and the number of workers was 1000. By 1986 RCA's sales rank 17 in the top 30 companies of

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<<http://www.libertytimes.com.tw/2001/new/apl/26/today-e6.htm>>

The chairman of the UMC Tsaur Xing Cheng, Vice President of Taiwan Semiconductor Manufacturing Company Ltd Tserng Fan Cheng, Chairman of Macronix International Co. Ltd. Hu Ding Hua, Chairman of Syntek Semiconductor Co. Ltd. Wang Guo Feng, Former Vice President of Winbond Electronics Corporation Yang Ding Yuan, Former Chairman of TOA Electronics Taiwan Corporation, Former General Director of Industrial Technology Research Institute Shi Qin Tai.

<sup>22</sup> Cowie, Jefferson. *Capital Moves: RCA's Seventy-Year Quest for Cheap Labor*. New York: Cornell University Press. 1999.

RCA has been attracted by the competitive labor price and the docile labor market of Taiwan, as well as the U.S. tariff provision 807 which state that a company that exported raw materials and parts, had them processed or assembled aboard, and re-imported the finished goods paid a tariff only on the value added outside of the country. With this tax the U.S. producers could maintain their place in the domestic market in face of the foreign (Japanese) competitors.

manufacturing industry, and the revenues of that year was 84 billion NTD, the capital was almost 65 billion NTD. As the exchange rate raise, the labor cost raised as well, Taiwan had been less competitive internationally, at same time the trade pack such as North American Free Trade Agreement and opening of Chinese market had significant impact on the global investment reshuffling. In 1986, RCA was purchase by General Electric; by 1988 GE sold RCA and GE consumer electronics to Thomson so the Taoyuan and Hsinchu plants were transfer from RCA to GE and to Thomson. And RCA production shift to Mexico or outsourcing to the other electronic firms in China. When the Taoyuan and Hsinchu facilities were sold from GE to Thomson, both side conducted the assessment of the condition of the production sites as per requirement of the United State Super Fund Laws because at the time Taiwan does not have laws to regulate transfer of the possible contaminated sites. GE first commissioned Dames and Moore to conduct the investigation, after they find the site was contaminated GE commissioned Bechtel Corporation to conduct the soil, soil vapor, surface water and ground water evaluation, Thomson commissioned Arthur D Little Limited to supervise the investigations. The contamination of the sites were confirmed by the both side (賈儀平), so in the sales contract it was stated that the GE has to be responsible for the contamination (丁力行). Although the contamination of the soil and water was know to the contractual parties, but they were unethical in keeping the

result of the investigation from the public. In U.S. Superfund Law requires that hazardous waste or the presence of the hazardous substance be disclose in a deed when a property is sold, however there were no such requirement in Taiwan, so the Thomson were able to sold the facilities with out public been aware of the contamination at the sites, and local residence unaware of the danger they live with.

In 1994, the Environmental Protection Agency holds a press conference to expose the pollution at the former RCA sites. It was suspected that RCA has been dumping the organic waste Volatile Organic Compound into the wells in the factories, therefore causing the serious contamination at Taoyuan and Hsinchu sites. The following day Executive Yuan organized “RCA Taiwan Contamination of the ground Water at the Production Sites Special Task Force Team” and a cross departments meeting was hold to decide upon a contingency plan, it was decided to wait for the completion of test result of the wells from the production sites, than further action could be taken. After the meeting EPA condemned firms for keep the contamination secret, and they would like to stop the change of the land use until the soil contamination report has been done, at same time it was hoped that the Statute of prevention of soil contamination could be pass by the Legislative Yuan(立法院) as soon as possible so in future event like this could be prevented.

After the contamination had been exposed, GE had refused to take responsibility of

the pollution by stating that there were no environmental laws to regulated the behavior of the corporation, at same time there was no laws which can trace the responsibility to the former proprietor. Although EPA had wanted to use the existing law to bring the corporation to justice, but the punishment for the environment pollution were light and obscure, GE and Thomson could regard the punishment as insignificant. In the end EPA bargain with GE and Thomson, for the co-operate with EPA in appraisal of pollution sites and cleanup effort, in exchange GE and Thomson would not be charged with criminal offense by EPA.<sup>23</sup> At that time all EPA could rely on was the business ethic of both company, and the fact that both company would be unwilling to let the news of such gross negligent be know to public and compromised their business reputation. As EPA wanted to negotiated a contract with GE and Thomson for cleanup of pollution, but EPA and RCA cannot agree upon the terms, therefore there were no signed documents between the parties.<sup>24</sup> All EPA was able to get from RCA was bottled water, install municipal water treatment facilities, and provide health evaluation etc. for the local residence. With inadequate regulation, corporations are not criminally liable for the environmental pollution they cause, government are not able to gain full co-operation from the corporations. With no legal liability on firm to compensate the victims, cases often get settle out of the court, and

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<sup>23</sup> Refer to reference 30.

<sup>24</sup> RCA Special Task Force Conference Minutes b, 1996-1997: 85-86

on the one hand there is little government can do other than use moral persuasion to induced compensation from corporation, on the other hand implementing strict environmental law could reduce foreign investment. Often when facing this dilemma, greater good of the society is sacrifice for the good of small number of elite group, as can be seen in the case of RCA.

In the report provided by GE and Thomson, the soil and ground water of the production sites was polluted by Trichloroethylene and Tetrachloroethylene. The level of the Dichloromethane in ground water at the sites is 3 to 120 times the standard of drink water set by World Health Organization, and if compare to the relatively more strict Taiwan standard, the level of Dichloroethane and Dichloroethylene are 1.3 to 200 times higher. Even the concentration of Trichloroethylene and Tetrachloroethylene in ground water as far as 2 kilometer from the production sites is 1000 times higher than the standard of drinking water. The Vinyl Chloride is known to cause cancer, and other chemicals belong to the categories like highly probable or probable cause of cancer.

GE and Thomson announced that they were willing to co-operate with EPA, and participate in dealing with contamination until EPA had been satisfied.<sup>25</sup> Although they did provided funds for the clean up of the production sites and GE install

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<sup>25</sup> China Times, 1994/6/9.

municipal water treatment facilities for the surrounding communities, they had use false data in the health evaluation report because they do not want an epidemiology study on the workers and local residence. At the same time report was questioned by EPA for insufficient data and information, large number of assumption and comparison of worker who are relatively healthier to the residence who were mostly elderly and children.

With different opinions between specialist at EPA and RCA, RCA was firm in that the epidemiological study was unnecessary, later EPA give in and agreed that the epidemiological study was unnecessary, GE and Thomson only need to be responsible for the clean up of the soil and ground water contamination. In the clean up prospectus provided by the GE and Thomson, the plan was to treat the contaminated soil and ground water by vapor extraction, however this treatment is not effective in cleanup of the contaminated ground water. From the agreement proposed by GE and Thomson in the 14<sup>th</sup> meeting with the RCA Special Task Force<sup>26</sup>, it was obvious that corporations were not interested in the effectiveness of the cleanup; the reason that GE and Thomson co-operated with EPA was for the business reputation.

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<sup>26</sup> RCA Special Task Force Conference Minutes b, 1996-1997: 145-151

The agreement contains provision such as the "...after the cleanup prospectus had been accepted by EPA Taiwan, EPA could not ask for further investigation or cleanup of the soil", "...EPA Taiwan has no right in requiring further sample of ground water in the area not included in the cleanup prospectus", "...EPA Taiwan have agreed to the management plan of the ground water, but can not required further cleanup from GE and Thomson...", "...this prospectus is not to be interpreted as acceptance of any responsibility by us".

By 1998, it has become clear that the ground water can not be restore to the level of drinking water, GE and Thomson suggested “Natural Attenuation”<sup>27</sup> should be use to solve the pollution at the production site, and the corporations intended to site “Technically Impracticable”<sup>28</sup> clauses, so the cleanups of the sites could be stopped and the most serious contamination area would be close off and rest of the area could be utilize and redeveloped. However, the natural attenuation assume the soil would not be disturbed, this seems unlikely since beginning of the 1998 the new owner had apply for change of land usage of the sites, from industrial to residential and commercial use. At same time if the cleanup of the groundwater was stopped, the contamination could spread, and set bad example for the future polluters.

The worker of RCA discovered that they have been effect by the chemicals used in production, workers claim that the poisonous chemicals was dump in the wells in the production site as per instruct by managers, and they were drinking the contaminated

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<sup>27</sup> Tulis, D. “Issues associated with Natural Attenuation.” *Office of Underground Storage Tanks*. 9 Aug. 2002. U.S. Environmental Protection Agency. 4 Apr. 2004  
<<http://www.epa.gov/swrust1/rbdm/issues.htm>>

U.S. EPA defines natural attenuation as reliance on natural attenuation process to achieve site specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods. Natural attenuation process include a variety of physical, chemical, or biological process, that under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants.  
EPA, OSWER Directive 9200.4-17P

<sup>28</sup> “Non-aqueous phase liquids and ground water.” *Superfund*. 31 Jul. 2004. U.S. Environmental Protection Agency. 5 Aug. 2004 <[http://www.epa.gov/superfund/resources/gwdocs/non\\_aqu.htm](http://www.epa.gov/superfund/resources/gwdocs/non_aqu.htm)>  
Technically impracticable is where it has been determined that active remedial measures would be unable to significantly speed remediation time frames. And contaminants are expected to remain in place over long periods of time, as in the first two examples, TI waivers must be obtained. In all cases, extensive site characterization is required.

ground water, while the managers drink the bottled water, at same time RCA did not offered protective gear to the workers. Chemicals such as Trichloroethylene<sup>29</sup> and Tetrachloroethylene<sup>30</sup> had been found to cause cancer when come into contact with human. In the questionnaire conducted by Taoyuan County government in1998, out of sample of 768 of RCA worker, 362 workers got cancer or other disease and 59 workers had die from the cancer. Many female workers give birth to stillborn baby and/or suffer from uterine cancer, male suffered from liver cancer (王榮德). In 1998 RCA Workers' Self Assisting Organization (RCA 員工自救會) was established, 1059 of its members has got cancer, 216 members die from cancer and 102 members had tumor.

Today, GE and Thomson had spent NTD 2 billion on the cleanups of the soil and ground water, but none of the former RCA workers had received compensation. In the past RCA had been model export firms, their investment in Taiwan had yield high returns. However the RCA investment seen to move once the labor at the production sites has start to demand better working condition and/or increase in wages (Cowie,

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<sup>29</sup> Agency for Toxic Substance and Disease Registry  
<http://www.atsdr.cdc.gov/toxprofiles/phs19.html>

High level of exposure to trichloroethylene can cause liver and kidney damages, likely to cause respiratory cancer in older man, and leukemia in women and children. And children could born with heart defect, however more study has to be done on the effect of trichloroethylene on human.

<sup>30</sup> Agency for Toxic Substance and Disease Registry  
<http://www.atsdr.cdc.gov/tfacts18.html>

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen, which is known to cause cancer. Women who were exposed to tetrachloroethylene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed.

10), as the operating expense increase at particular site, the RCA shift production to less industrialized area, which is desperate for the prosperity industrialization could bring, and workers are more vulnerable to exploitation.

To this day the RCA still maintain that they have nothing to do with the cancer epidemic in it's former workers, and to make things worst the scientific studies conducted by the Taiwan government that showed no link between health impacts and contamination at the site. In the 2001, under the new government, the Executive Yuan RCA Special Task Force was dismissed; the reason was "the cleanup has come to an end". The Control Yuan (監察院) had criticized government for over look the welfare of workers and residence in the RCA case in 1998, and it had ask the related department to improve on this area. As the Executive Yuan dismissed the RCA Special Task Force, the change of land usage application by the Zhang Yi Consortium (new owner of the RCA Taoyuan site) had been allowed<sup>31</sup>, at same time the RCA had secretively move capital out of Taiwan, the capital decrease from the 24 billion to mere NTD10 million. All this had make the workers question the loyalty of the government, the RCA workers has been paying for the law suite, their own medical bills and put up with lack of assistance from the government, while the corporations through co-operation with government were able to reap the benefit at cost to the

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<sup>31</sup> Hwa, C. H. "RCA's former worker do not get compensation." Taipei: Central financial and industrial times. 14 Jun. 2001.

worker. Especially in this case, racketeering could be suspected on the both side.

As government had clearly sided with RCA and refuse to seek justice for the former RCA workers and people who live near the RCA production sites. The RCA had openly denied any responsibility for the cancer epidemic among its former workers, and refuse to be involved in the cleanups of the sites. Firms within the Hsinchu Science Industrial Park had adapted this kind of attitude, their production method was causing harm to the environment, but they would not be responsible for the contaminations for example the UMC incident in 1999. The worst thing about this is that firms could get away with it because the structure of Science Industrial Park made it difficult to find the culprit as can be seen in the Table Five, where some polluter is unknown. Government tends to favor the Capitalist just as they did in the RCA case, since Capitalist in the hot industries carries a lot of economic power. In dealing with pollution, government had become the defender of the Capitalist, often they often shred the detail of pollution in the veil of secrecy away from public scrutiny.

One good thing come out of this debacle is the legislature of the Statue of Soil Pollution Prevention (符樹強), the developed countries such as Japan and U.S. had

established such laws during the 70s and 80s. This draft statute is to

- i) Increase the transparency of the cases,
- ii) Focus in the cleanups,
- iii) Set up source of the cleanup fund,
- iv) Responsibility of the polluter,
- v) Cleanup of the soil and land utilization

It was hoped with this statute the cases like RCA can be prevented. As an industrialized country, Taiwan desperately needed the environmental protection law, to protect her workers from industrial pollution. Especially with Taiwan been a major manufacturer of the semiconductor and electronics products, and production of semiconductors use some of the most toxic chemicals used in any industry (Mazurek, 5). As the number of the chemical use in the production would likely to increase since the industry needs chemical and water to add to the production capacity, effect of individual chemicals used were not known, let along the effect of the mixed chemicals after the production. In the past the Taiwan production was slower than that of the foreign manufacturers, so we were able to observed the effect of the chemical have on the worker and environment, but as Taiwan Semiconductor and UMC's production catch up to that of Intel (邱花妹), Taiwan is now in the frontline of the production, the manufacturers will be experimenting with the chemicals first handed. With weak

environmental law and insufficient waste treatment facilities, the industrial waste treatment would not be able to catch up to the production speed, this means that the disaster on the scale of Fairchild contamination looms in the future.

### 2.3 Verdict

In the late 90s, the pollution problem at the Hsinchu Science Industrial Park began to surface, from discharge of wasted water into the Ke Zi Hwu River (柯子湖溪) in 1997 to the leaking of the oil pipes in 2004. Over dozen cases have emerged in the past few years; this has called into question the waste management by the Hsinchu Science Industrial Park. Especially the case of Sheng Li (昇利) and Eternal Chemical Corporation (長興化工), expose the illegal dumping of the poisonous chemical, in less than 3 years' time Sheng Li had dumped 13,500 tons of chemicals they were commissioned by Eternal to be disposed of into the Kaoping River<sup>32</sup>. And Eternal is just one of the hundred of customers of Sheng Li, over 80% of the companies in Hsinchu Science Industrial Park were customers of Sheng Li.

Cases like this show how vulnerable Taiwan's natural environment is, at the same time it

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<sup>32</sup> Chun, R. C. "Kaoping river pollution, 5 prosecuted." Taipei: Commercial times. 16 Aug. 2000.

exposes how ineffective government official is in control and monitor the whereabouts of the chemical waste. Especially when government taking the side of the Capitalist, local authority can do little to regulate the behavior of corporation. Especially with inadequate environmental laws, there is no regulation by which to set the punishment for the corporations. And in LCY and RCA case, in allowing the change of land use control government is under suspicion of collusion with the corporation for profiteering purposes, local government, workers and local residence were left to pay the price and coped with the consequence. In the past decade, many corporations shift their production site to the Mainland China, because of the cheap labor and production costs as well as the large Chinese market. Most recently Taiwan Semiconductor Manufacturing Company (台灣積體電路製造股份有限公司) has invested in the production plant of eight inches wafer in China, although there was many political obstacles this move was inevitable<sup>33</sup>. However in 1997, LCY Chemical Industrial Corporation had already shift production to Mainland China, and RCA had moved production to NAFTA free trade area and China, as those corporations reallocated production site they move resource and revenues as well, social and environmental problem were left behind, society as a whole were worst off, as few individual (Capitalist) benefited.

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<sup>33</sup> Young, I. W. "Interview Morris Chang/Morris Chang: TSM would start production in China next year." 26 Apr. 2002.

Coase believe that with or without transaction cost, government regulations would not lead to the Pareto optimum results, and the utilities should be compared, the damaging party and damaged party could negotiate to reach a mutually beneficial agreement. In the case of the dead fish cause by the polluted water, the value of the dead fish is compare to the value of the semiconductor products produced (1-44) (which mostly is export to the foreign market, not utilized by the domestic consumers, and because of the government policy the gain from the sale of the products belong to the few members of the society). However the reality is not that simple, the industrial pollution affected all living beings and it has spin-off affects, the total cost to the environment have to be weight against the total gain of the production. It was implied by Coase that the damaging and damaged party can bargain on the equal footing, in reality it is not always true, in the industrial pollution case most often the firm (Capitalist) has more resources than the victim (workers), at same time with asymmetric information, it is difficult for victims to specified the cause of pollution, much less proof guilt of the firm, also the asymmetric information make risk avoidance impossible.

The environmental pollution is not the only impact Semiconductor industries have on the Taiwan economy. Taiwan is not exactly a water rich island, with the amount of

water and energy needed in the semiconductor production, government on the one hand build new dams to increase supply of water on the other hand constructed more power house to keep the supply of electricity stable. However, in the past few years rain fall had decrease dramatically, which intensified the situation in Hsinchu, the Executive Yuan had call for the farmers to stop farming so the water that was suppose to use for agricultural purpose could be utilized by firms in Hsinchu Science Industrial Park. This would also have great impact on the environment, could cause the further raise in temperature as well as causing further water shortage. The government tend to compare the production value when making decision, of course there is no way that the production value of the agriculture goods could be greater than the production value of the semiconductors, at same time this has call to the question of fair distribution.

When the foreign capital and technology enter the country, their production method would have impact on society and environment, it is up to government to regulated the production so that negative impacts are keep to a minimum, however this is difficult in the competitive global economy. Taiwan government had never placed much important in controlling the industrial pollution, which means pollution prevention were not on the priority list of the firm. Storage and disposal of the

industrial waste were unchecked, firms adapted irresponsible attitude toward pollution which is obvious from the earlier case of LCY to the relatively recent cases of Eternal Chemical, Macronix, and Tyntek.